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S·A·E JOURNAL

OCTOBER 1932

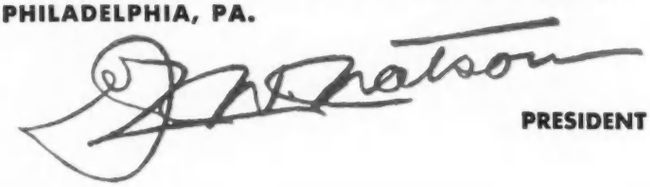
When a *Split Second* Counts

MANY motorists think side sway is merely something which causes them to be uncomfortable. One has to be caught in a pinch to have brought home to him the real menace of side sway.

Fortunately, relatively few motorists have experienced a real pinch. But when that pinch comes, split second accuracy and certainty of control is an absolute demand. Without the ability to negotiate a precise swerve this way or that way to dodge the trouble, catastrophe follows.

A modern shock absorber for modern speeds must not only provide comfort against the up and down irregularities of the road, but must also provide, in full measure, a firm control against side sway, the greatest enemy of safe motoring.

JOHN WARREN WATSON COMPANY
PHILADELPHIA, PA.



PRESIDENT

GYRO

FIRM AGAINST SIDE SWAY

S·A·E· JOURNAL

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JOHN A. C. WARNER, *Secretary*
C. W. SPICER, *Treasurer*

Vol. 31 October, 1932 No. 4

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NOTE: Page numbers above that are preceded by (T) refer to the TRANSACTIONS section (between pp. 20 and 21 of the advertising and news section) containing papers and discussions that will be embodied in the volume of S.A.E. TRANSACTIONS for 1932, to be issued early in 1933.

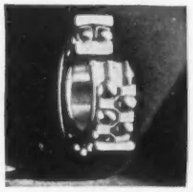
The purpose of meetings of the Society is largely to provide a forum for the presentation of straightforward and frank discussion. Discussion of this kind is encouraged. However, owing to the nature of the Society as an organization, it cannot be responsible for statements or opinions advanced in papers or in discussions at its meetings. The Constitution of the Society has long contained a provision to this effect.

24-HOUR SERVICE CERTAIN WITH SKF DEPENDABILITY

ANOTHER "PERFORMANCE" USER
The Corbitt Company

WHERE PERFORMANCE TAKES PREFERENCE OVER PRICE

"SKF bearings are giving very good service up to 100,000 miles and over even in some instances where it is practically impossible to keep the bearings free from water and grit," says The Corbitt Company of the SKF Self-Aligning Ball Bearings and housings which they use on the propeller shaft location of trucks and buses.



The bus shown is one of a fleet operating on a short run between Alexandria, Va. and Washington, D. C. These buses average about 20 hours on the road every day and, while they are 18-passenger capacity, often carry up to 45 people. Continuity of service, dependability and low costs are mighty important for this work. SKF Performance Takes Preference Over Price because it fully meets these exacting requirements... with the lowest cost per bearing mile.

You may buy a bearing as a bargain but try and get a bargain out of using it, for nothing is apt to cost so much as a bearing that cost so little.

2938

SKF INDUSTRIES, INC. 40 EAST 34th STREET, NEW YORK, N. Y.

SKF

Ball and Roller Bearings

Factory Men Analyze Equipment and Production Methods

Buffalo Meeting Brings Expert Advice on Design-Production Coordination and New Facts on Modern Cutting-Tools and Die-Casting Alloys

LIMITATIONS that are placed on original automotive designs by restrictive conditions of manufacturing equipment and methods supplied the principal topic of discussion at the Society's Production Meeting in Buffalo on Oct. 3. Current applications of cemented-carbide tooling and special zinc alloys for die casting were among the other subjects that were raised for careful consideration.

Design-Equipment Coordination

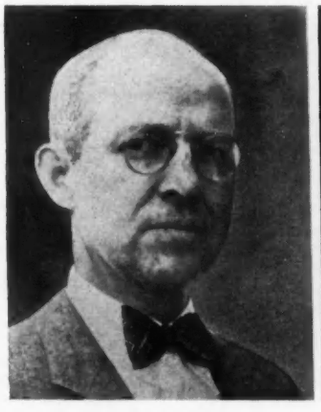
The design-production paper by Alex Taub, of the Chevrolet engineering department, printed elsewhere in this issue of THE JOURNAL, treated the subject of equipment limitations of design from the design engineer's point of view and emphasized the limitations that are placed on the selection of new designs, the degree of manufacturing accuracy that can be expected, the qualities of the finishes on parts and materials and the mobility for changes, that are at present imposed on the designer by the manufacturing department. The paper states that the day of the production specialist, instead of being gone as is frequently said, is just beginning; that the need for production ingenuity is greater today than ever before, and that it has become increasingly evident that intimate contact between the shop and the engineering department is essential so that each can fully recognize the prevailing conditions affecting the other, and properly allow for them in the plans.

L. F. Maurer, of the Pierce-Arrow Motor Car Co., handled the subject more from the manufacturing executive's point of view, dealing in a general way with the selection and operation of production machinery and tools as governed by the requirements of economic production and taking into consideration the adaptability of such equipment to changes in designing new models.

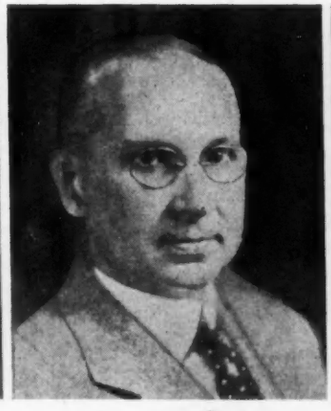
Zinc Alloys and Cemented-Carbide Tooling

Through the use of a film with accompanying explanation, C. R. Maxon, of the New Jersey Zinc Co., showed the manufacturing processes of zinc alloys suitable for die casting, the uses of the metal in die-casting plants and the development of nickel-chromium-plating processes.

R. D. Prosser, of Thos. Prosser & Son, spoke in some detail on the current applications of cemented-carbide tooling. The paper indicated that the technique in the manufacture of cemented carbides has progressed sufficiently to produce various grades that are especially suitable for different applications and that these have resulted in savings in manufacturing costs that would not have been possible otherwise. Mr. Prosser described the use of



F. A. CORNELL



L. F. MAURER

ALEX TAUB

R. D. PROSSER

the standard grade for the majority of general work on gray cast iron and brass and other non-ferrous materials, as well as on work of intermittent character where the best possible combination of toughness and hardness is desired.

One of the special grades that has been developed for the machining of chilled cast iron was described and illustrated by a number of photographs of machining operations on glass and other hard materials. Possibly one of the more important specially developed cemented carbides described is that designed for long life between grinds, which was developed especially for the automobile manufacturers for particular work and high production economy involving reamers, broaches, end mills and forming tools requiring only infrequent grinding. Interesting illustrations of the applications of a grade for very rapid production, extremely fine finish and very close tolerances were shown.

Among the newer applications of cemented carbide described by Mr. Prosser were examples such as the facing of snap gages, measuring instruments, spring-forming guides and the like. The recent successful application of tungsten carbide to sawtooth facings was also mentioned. An important part of the paper and motion picture was a description of the preparation of the shanks and the brazing, cooling and grinding processes involved in the manufacture of these tools, and illustrations of the machining of a number of different materials at extremely high speeds that is possible only with cemented-tungsten carbide.

Immediately following the session, a production luncheon was staged under the joint auspices of the American Society of Mechanical Engineers and the Society of Automotive Engineers. Chairman Joseph Geschelin, after being introduced by M. A. Thorne, Chairman of the Buffalo Section of the S.A.E., turned the session over to K. H. Condit for informal handling of his paper on Adjusting Equipment to Current Conditions, scheduled through the courtesy of the A.S.M.E.

A Week of Many Events

The Production Meeting was held in conjunction with the National Metal Congress and Exposition, during the week in which six National societies and associations cooperated under the general auspices of the American Society for Steel Treating. The technical programs of the cooperating societies contained a large variety of papers and discussions relating to manufacturing, equipment, materials and processes in their latest developments.

The National Metal Exhibition, at the 174th Regiment Armory, was open each afternoon and evening of the week to the members and guests of the societies participating in the convention. More than 100 exhibits of equipment and materials for both general and special-purpose manufacturing formed interesting and instructive displays. A large number of exhibits were in the nature of demonstrations of welding, heat-treating, chemical processes and the like, for both customary and special purposes.

Production Activity Committee Meets

The Production Activity Committee and its Meetings Committee took advantage of the opportunity afforded by the convention to hold a meeting on Monday afternoon, called by Vice-President J. E. Padgett, at which plans for the Production Session to be held during the Annual Meeting of the Society in Detroit next January were discussed. Further announcements of the plans for this session will be made by Joseph Geschelin, Chairman of the Production Meetings Committee, later on, in conjunction with the general program for the Annual Meeting.

Buffalo Section Helps

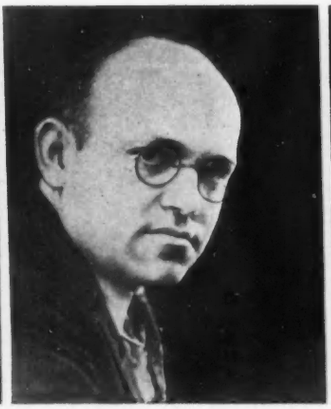
An important element that contributed to the success of the Production Meeting was the cooperation of the S.A.E. Buffalo Section under the leadership of its Chairman, M. A. Thorne, of the Pierce-Arrow Motor Car Co.

Vice-President Padgett and Meetings Committee Chairman J. E. Geschelin, of the Production Activity, extend their thanks to the Section officers and members. They also acknowledge with appreciation the assistance of F. A. Cornell and members of the cooperating organizations. Great credit belongs to W. H. Eisenman, Secretary and General Manager of the A.S.S.T., who was largely responsible for the skillful engineering of the program for the week.

The national Societies and Associations cooperating in the week's program of the National Metals Congress are the American Institute of Mining and Metallurgical Engineers, the American Society of Mechanical Engineers, the American Welding Society, the American Drop Forging Institute, the Wire Association, the American Society for Steel Treating and the Society of Automotive Engineers. The programs for the sessions of these groups held during the week included papers on a wide variety of subjects of interest to production men.

C. R. MAXON

M. A. THORNE



JOSEPH GESCHELIN

K. H. CONDIT

A Message To Production Leaders

FAITH

J. E. Padgett, S.A.E. Vice-President
Representing Production Engineering

THE world is full of fear and cowardice. Men sit idle, wishing and hoping and dreaming. FAITH is the only force that can move a mountain, build a structure, create something new,—FAITH in your own ideals, FAITH in your associates and fellow men, FAITH in the destiny of humankind.

FAITH gives an open mind, generates wisdom, spurs to work, creates ideas, dispels fear, develops patience and gives to life its fullness. As production leaders you have a stupendous responsibility. Your actions guide the men who work with you. One of you with great FAITH can temper the storm for thousands. You become a solid rock to lean on.

Fear has pushed our Country and the world into the depths of despair.

FAITH is reborn to carry us up.

Be ye all of great FAITH and therefore worthy to lead your men truly in this upward movement.

J E Padgett

Spicer Mfg. Corp.

The Burden of Ruinous Taxation

Huge Aggregate of Multiple Taxes Stifling the Industry That Was Expected To Lead Country to Economic Recovery[1]

By President A. J. Scaife[2]

MOTOR-VEHICLE manufacturers and their dealers, the petroleum industry, truck and motorcoach operators and automobile owners should be and are deeply concerned over the excessive and unjust burden of taxation that has been heaped upon them and threatens to be increased still further. Forty-four State Legislatures will meet next winter. With the acute necessity of finding more ways of raising revenue under extraordinary conditions of business depression, together with a flood of propaganda to influence legislative action against highway transportation, the prospect of the introduction of more than the usual thousands of bills providing for increased levies and more drastic regulation of motor-vehicles is ominous.

Plans to meet and combat this threat as effectively as possible are in the making. They will require the support of all who can contribute to the fight any assistance in the way of informing legislators and the public regarding the facts as to the disproportionately heavy loads of taxation and restriction under which the motor-vehicle, petroleum and the allied industries are now staggering. Automotive engineers have seen and felt the painful effects of the great curtailment of production in the last three years and cannot contemplate placidly the further or even continued restriction of output through the imposition of more taxation and further limitation of vehicle size and weight and operating privileges. Members of the S.A.E. are vitally interested in the economic and technical problems of taxation and regulation.

Taxation Blocks Expected Leadership in Recovery

Following the panic of 1907 and the depressions of 1914 and 1920, the automobile industry was first to lead this Country out of the woods. Confidence and optimism were stimulated by the automobile shows and purchases of millions of dollars worth of parts and materials from thousands of suppliers all over the land restarted the wheels of industry in general. Last winter and the winter before, the business world looked hopefully to the automotive industry to repeat the miracle and the manufacturers strained every nerve to bring it about by making unprecedented improvement in the eye and price appeal and the performance of their product. But, disregarding predictions of killing the goose that laid the golden eggs, the Federal Congress enacted a tax measure imposing war-time sales taxes on motor-vehicles, parts and accessories and on gasoline and oil, and gasoline taxes and motor-truck license fees were increased by many State Legislatures.

All such imposts increase the prices of motor-vehicles and replacement parts and the operating cost to the vehicle user. Thousands of owners in the last year could not afford to pay the registration fees and operating and repair costs for cars already owned. In this connection, it is significant that 711,000 fewer cars were registered in the United States in 1931 than in 1930. The American Automobile Association estimates that the decrease since the first of this year has been at the rate of 100,000 per month.

Highway Users Organize To Fight

So grave is the situation that a second meeting was held in the City of Washington on June 28, at the call of Chairman Alfred P. Sloan, Jr., and C. F. Whiting, for the organization of the Highway Users Conference, on which more than 40 important National organizations are represented. The purposes of the Conference are to encourage the development of equitable bases of taxation for the use of public highways and to prevent the imposition of undue burdens upon highway traffic. The main functions are to act as a clearing house for collecting and disseminating to its members information concerning legislation affecting the taxation and regulation of motor-vehicles and taxation of products used in motor transportation and to assist in coordinating activities of the member organizations in carrying out the purpose of the Conference. The Conference has expressed itself favorably toward the principle of having just and equitable tax burdens shared by those who should share them.

Taxes Piled on Taxes

The following statements regarding motor-vehicle taxes and their effects were presented before the Ways and Means Committee of the House of Representatives last winter.

Owners of the Nation's 26,000,000 motor-vehicles in 1931 paid more than $1,000,000,000 in gasoline taxes, license fees and other State and municipal levies. These are all special taxes in addition to the same general taxes paid by motor-vehicle owners and other taxpayers. This aggregate sum is 10 per cent of all taxes of all kinds collected in the United States by all governmental divisions.

Federal sales taxes will defer, and possibly defeat, the vitally important program of getting the people back to work. They are a direct assessment on the depleted incomes of the American home.

Any development that is harmful to the automobile industry is a blow to every section of the United States. Forty-one States have automotive plants and every State, without an exception, is a producer of materials that enter into the manufacture of automobiles.

In spite of a drop in volume from 5,358,000 cars and trucks in 1929 to 2,385,000 in 1931, we have continued to reduce prices while at the same time putting more quality, performance, safety and beauty into our product out of a belief that, in a market like the present one, it takes the extraordinary to win back the buyer.

Economists have credited us with inaugurating the great era of prosperity that gave more money to more people than had ever been known before. They also predict that the return of good business can best be achieved through the automobile industry.

One-tenth of those employed in gainful occupations, or 4,022,000 workers, take their livelihood directly or indirectly from the automobile business in the United States. The payroll of automobile and parts manufacturers in 1929 had increased to the enormous total of $870,612,000 per year.

Farmers are the greatest purchasers of automobiles. They own 5,000,000 of the cars and trucks now running in the United States, and of these more than 900,000 are trucks—26 per cent of the total truck registration.

With volume reduced, we would probably have to raise our prices even beyond the tax increase, which would make still more difficult our penetration into foreign markets.

Two-thirds of all motor-car buyers have incomes of $3,000 or less.

In the year 1931 the motor-vehicle paid in taxes an average of $39.40 each, or 19.9 per cent of its valuation. This is the highest tax on any non-luxury form of property in the United States today.

At the rate of the 1931 tax, the average motor-vehicle would pay 139 per cent of its average valuation in the course of its life of approximately seven years.

The cost of car operation has reached the point where hundreds of thousands of usable cars are not even registered, because in many instances the owners cannot afford the initial price of license tags.

In spite of a 583,000 decrease in motor-vehicle registration in the last year, the curve of taxation is still rising. Nine States increased their gasoline taxes an extra cent per gallon during 1931, one State added one-half cent and one jumped the rate two cents.

The motor levy today is almost eight times as heavy as the tax on urban real estate.

During the period from 1921 to 1930, motor-vehicles taxes increased 455.1 per cent, as compared with an increase of 150 per cent in motor-vehicle registration.

If a resident of Mobile, Ala., had purchased one of the average motor-vehicles sold during 1931, his city, county and State taxes would have been $65.78. A new vehicle worth $776.18 would have an average

[1] The facts herein given have been presented by President Scaife in addresses at meetings of many Sections of the Society.

[2] M.S.A.E.—Consulting field engineer, White Motor Co., Cleveland.

value over its average life of seven years of $197.77. Upon this average value it would pay in seven years a total of $406.46, or 2 1/3 times its average value.

At present no less than 12 different forms of taxes on passenger cars have secured a foothold: State registration fees, gasoline taxes, personal-property taxes, drivers' license fees, registration-card fees and certificate-of-title fees; county gasoline and personal-property taxes and city gasoline taxes, wheel taxes, drivers' license fees, registration fees and personal-property taxes.

The 12 taxes cited are not levied in any one place. The fact, however, that every one of these taxes is currently applied, together with the fact that the spread of a tax is rapid once the source is tapped, is cause for grave concern. A battle of serious proportions is under way over the rival claims of State, county and city governments for the tax money of the motorists and the right to tax. This scramble among the various taxing agencies resulted in pyramiding the tax rate.

Strangling the Oil Industry

How the petroleum industry is being throttled by multiplied excessive taxation is shown in the following statements by W. R. Boyd, Jr., vice-president of the American Petroleum Institute:

Undoubtedly the time has come to halt the public procession long enough to redistribute the tax burden more equitably.

Motor fuels last year yielded in State gasoline taxes alone more than $536,000,000. The weighted average tax was nearly 4 cents per gal. The Revenue Act of 1932 permits the Federal Government to take $150,000,000 from a tax of 1 cent per gal. on gasoline, $35,000,000 from a 4-cent-per-gal. tax on lubricants and $8,000,000 from a 4-per-cent tax on pipeline cargoes.

Petroleum is asked to pay 17 per cent of the $1,118,500,000 that the Treasury Department hopes to derive from all the new taxes.

The State gasoline tax, devised in 1919 to finance highways, has spread to every State. It has been adopted by the Federal Government and by county and city governments, and there is agitation not only for increased gasoline rates but for diversion of this income to the various functions of government.

Today as much as 11 cents is collected in tax on 1 gal. of gasoline. State gasoline rates range from 2 to 7 cents per gal., and with Federal, county and/or city gasoline taxes added, the range is from 3 to 11 cents per gal.

Gasoline taxes, plus other taxes upon the petroleum industry, in 1931 represented an 85-cent assessment per barrel of crude oil produced; yet the average price paid the producer throughout the year was only 65 cents. Here, then, is a product taxed 25 per cent by the Federal Government and as high as 200 per cent by other governmental bodies.

This third largest industry in the United States suffered heavy losses in 1931. It then was paying the largest tax bill in history.

Even in the most profitable year, 1925, the industry's net earnings, $471,106,534, represented only 4.96-per-cent return. During that year the industry paid a total tax bill of $309,393,266. A fair estimate of the industry's 1932 tax bill indicates it will be $918,000,000, or 46 per cent more than in 1930.

This industry currently faces a threatening situation. Its principal commodity, gasoline, goes into a retail market bearing a tax of 125 per cent or more on its wholesale price. Its annual tax bill amounts to 3½ times the net income. The market is disturbed by wholesale evasion growing out of a system of taxes so varied and so exorbitant as to place an alluring premium on law-breaking and tax evasion.

Motor-Vehicles Pay for Highways

Much misinformation has been fed to the public through the press to foster the belief that motor-vehicles are subsidized by the State through heavy public expenditures upon the roads which motor-trucks and motorcoaches use as free rights-of-way. The actual conditions are revealed in the following statements made by Thomas H. MacDonald, chief of the Bureau of Public Roads, before the Interstate Commerce Commission:

The special motor-tax share of State and local road income increased from 10.8 per cent in 1921 to 46.5 per cent in 1930.

Three-fifths of the road expenditures come from motor taxes. Commercial motor-vehicles paid $293,305,000 in taxes for the year 1931. Special motor-vehicle taxes for 1931 amounted to $850,388,270. Total expenditures on State highways amounted to $979,997,847.

Maintenance of State and local highways in 1931 cost $475,912,487. Gasoline taxes alone in 1931 produced $536,397,458 and were distributed as follows: State highways, $354,017,281; local roads, $100,073,959; city streets, $19,449,888; all other highways, $19,442,737; administration, more than $2,000,000.

A certain minimum thickness of road is necessary regardless of whether the heavier motorcoaches and trucks exist or not. Not until we get to the 5-ton truck do we have to increase the dimensions of the road, and then only by ½-in. thickness, or about 7.7 per cent; and for a 7½-ton truck, 1.154 in., or about 15.4 per cent.

Because of the considerably higher taxes paid through the gas, registration and other special taxes, any increase in cost made necessary by the heavier loads is being paid for, because it is not a large figure.

In the period from 1921 to 1931, motor-vehicle owners paid $7,600,000,000 in special taxes to State and local governments. These taxes were simply motor tolls specially earmarked for highway maintenance and construction. Add to this $1,000,000,000 in road bonds issued by the States as a definite charge on the highway users, since they are to be retired from motor-vehicle revenues, and it will be seen that motor owners directly shouldered $9,000,000,000 out of the $12,000,000,000 road expenditures by the States and counties in that period.

At the moment, Federal aid is on a basis of $125,000,000 a year, but special motor taxes are on a basis of $258,000,000. Thus the highway users are paying the United States Government at the rate of $2 in Federal taxes for $1 in Federal aid.

Truck Competition with Railroads

That there is slight basis for complaint against the competition of motor carriers and pleas for relief of the railroads from discrimination by imposing additional taxes and regulation on motor-trucks and motorcoaches is shown by the following figures:

Farmers use 26 per cent of all motor-trucks registered. Of the total registration, trucks engaged in interstate commerce represent 1 per cent, intrastate trucks 4.45 per cent, contract-carrier trucks 8.7 per cent and privately owned trucks 85.8 per cent.

Automotive freight shipped by rail in 1931 aggregated 3,106,645 car loads, producing a revenue of $396,738,000.

The 3,490,000 trucks registered in 1931, were owned by 2,500,000 individuals, of whom 2,200,000 owned only 1 truck.

Traffic surveys show that the majority of truck movement is between 40 and 60 miles, while the great bulk of truck movement is within a 120-mile limit.

No operation of motor-trucks is comparable with that of the railroads except that from 1.5 to 2 per cent of the trucks of the Country are engaged as interstate common carriers.

The motor-truck is simply the outgrowth of the horse and wagon, doing a bigger job in a better way.

Merchandise handled by these trucks cannot be forced back to the rails. It is unprofitable business for the railroads. Figures recently released show that 2.6 per cent of all rail freight carried in 1930 was less-than-carload freight and required 26 per cent of all railroad equipment to move it. This is an average of less than 3 tons per car having a capacity of from 40 to 50 tons. This class of freight netted 10 per cent of the gross earnings of the railroads.

We have all the laws on motor-vehicle operation and taxation that we need on the statute books now; what we need is not new laws but enforcement of present laws. Under the fair enforcement of present laws the highway transport problem should be considered, not as a legislative problem, but as an economic problem of furnishing to the public the type of transportation it wants at a fair and reasonable price.

Dickinson Nominated for S.A.E. Presidency

Annual and Professional Activities Nominating Committees Present Slate of Nominees for Society Offices for the Coming Year

NINE Nominating Committees, selected by S.A.E. members, have completed their duties and present herewith their choice of men to guide the work of the Society during the 1933 administrative year. Late in October, ballots will be mailed to afford every member an opportunity to vote his preference. On or about Dec. 15, the tellers will count the ballots so that the results of the election can be announced at the first business session of the Society following that date.

The Annual Nominating Committee consists of one member of the Society elected from and by each Section and three members elected at the business session of the Annual Meeting that was held in Detroit last January. Since its organization meeting in Detroit in January, this Committee has reported nominations for the Presidency, Treasurership and three Councilorships.

Eight Professional Activity Nominating Committees, each consisting of four Society members elected at business sessions of the respective Professional Activities, also have reported their nominations for Vice-Presidents as indicated in the accompanying list of nominees.

In order that suitable recognition and appreciation may be given, the names of members of the nine Committees are given on the following pages.

Who the Nominees Are

Dr. H. C. Dickinson.—Chief, heat and power division, Bureau of Standards, since 1922. Formerly, physicist in charge of powerplants research at the Bureau. Elected to Member grade in the Society in 1918. Manager, research department, Society of Automotive Engineers, 1921-1923. Member, Research Committee, 1922-1932; Chairman, Research Committee, 1926-1928; member, Fuels Subcommittee, 1926-1932; Chairman, Riding-Qualities Subcommittee, 1926-1932; member, Highways Subcommittee, 1926-1932; member, Headlighting Subcommittee, 1926-1932; member, Cooperative Fuel-Research Steering Committee, 1929-1932; Chairman, Highways Subcommittee, 1930-1932; Secretary, Lubricants Subcommittee, 1932; Second Vice-President, representing motor-car engineering, 1930.

Clarence M. Young.—Assistant Secretary of Commerce for Aeronautics, City of Washington. During the World War served overseas for 18 months in the Army Air Service; executive secretary, Municipal Research Bureau of Des Moines for several years after the war; chief of the regulations division, aeronautics branch, Department of Commerce, 1926; director of aeronautics, Department of Commerce, 1927-1930. Elected to Member grade in the Society in 1928. Member, Aircraft Activities Committee, 1931; Vice-Chairman Aircraft Activities Committee, 1932.

A. V. D. Willgoos.—Chief engineer, Pratt & Whitney Aircraft Co. since 1925. Engaged in the automobile and aeronautic industries since 1911, as chief draftsman of Simplex Automobile Co. and its successors, the Wright-Martin Aircraft Corp. and Wright Aeronautical Corp.; assistant engineer in charge of engine design, Wright Aeronautical Corp., 1921-1925. Elected to Member grade in the Society in 1920. Member, Aircraft-Engine Division, Standards Committee, 1931; Vice-Chairman, Aircraft-Engine Activity Committee, 1932.

Harte Cooke.—Engineer, McIntosh & Seymour Corp., with which he first became connected in 1892 as draftsman. From 1913 to the present, engaged in Diesel engine work for the company. Elected to Member grade in the Society in 1926. Member, Diesel-Engine Activities Committee, 1930-1931; Vice-Chairman, Diesel-Engine Activities Committee, 1932; member, Diesel-Engine Division, Standards Committee, 1930-1932.

M. C. Horine.—Sales-promotion manager, International Motor Co. since 1924; previously engineer with company from 1917. Technical editor, *Motor Age*, 1912-1913; editor, *Commercial Vehicle*, 1913-1917. Elected to Junior Member grade in the Society in 1917 and transferred to Member grade in 1920. Member, Science of Truck Operation Committee, 1921; member, Motor-Truck Division, Standards Committee, 1922-1929; member, Chain Division, Standards Committee, 1922-1925; member, Sectional Committee on Bolt, Nut and Rivet Proportions, 1925-1928; member, Operation and Maintenance Committee, 1927; member, Publication Committee, 1929; member, Motorcoach and Motor-Truck Activity Committee, 1930-1932; member, Motorcoach and Motor-Truck Division, Standards Committee, 1931-1932; Secretary, Metropolitan Section, 1920; Treasurer, Metropolitan Section, 1932.

J. M. Crawford.—Chief engineer, Chevrolet Motor Co., Detroit. Assistant engineer in charge of design, American Motors Co., 1907-1912; designing engineer, Chalmers Motor Co., 1912-1917; chief engineer, Allen Motor Co., 1917-1922; chief engineer, Auburn Automobile Co., 1922-1929; assistant chief engineer, Chevrolet Motor Co., 1929-1930. Elected to Member grade in the Society in 1920. Member, Passenger-Car Activity Committee, 1930-1931; member, Sections Committee, 1930; Vice-Chairman, Passenger-Car Activity Committee, 1932.

Roy F. Anderson.—Sales engineer, Murray Corp. of America. Elected to Member grade in the Society in 1925. Engaged in automobile-body drafting and engineering since 1909, with Studebaker Bros. Mfg. Co. and Studebaker Corp., Packard Motor Car Co., Hayes-Ionia Co., of which he was chief engineer; Mitchell Motors Co., as body engineer; and H. & M. Body Corp., as body engineer. Member, Passenger-Car-Body Activity Committee, 1931; Vice-Chairman, Passenger-Car-Body Activity Committee, 1932; Vice-Chairman, Detroit Section, representing passenger-car bodies, 1932.

Fred W. Cederleaf.—Works manager, Muncie Products Division, General Motors Corp. Chief die designer, Studebaker Corp. in charge of production and planning, 1914-1917; chief engineer, Sparks-Withington Co., 1919-1921; factory manager, Metal Specialty Co., 1923; superintendent, stamping division, A. C. Spark Plug Co., 1924; assistant factory manager, art-metal division, plant No. 16, Ternstedt Mfg. Co., 1926; tool-division superintendent, Olds Motor Works, 1927-1930. Elected to Member grade in the Society in 1919. Member, Production Activity Committee, 1932.

J. F. Winchester.—Superintendent of

(*Continued on p.* 25)

NOMINEES FOR OFFICERS AND MEMBERS OF THE COUNCIL

President

H. C. Dickinson

Vice-Presidents

Clarence M. Young, Representing Aircraft Engineering

A. V. D. Willgoos, Representing Aircraft-Engine Engineering

Harte Cooke, Representing Diesel-Engine Engineering

M. C. Horine, Representing Motor-Truck and Motorcoach Engineering

J. M. Crawford, Representing Passenger-Car Engineering

Roy F. Anderson, Representing Passenger-Car-Body Engineering

Fred W. Cederleaf, Representing Production Engineering

J. F. Winchester, Representing Transportation and Maintenance Engineering

Councilors

Term of 1933-1934

W. T. Fishleigh
G. W. Lewis
W. G. Wall

Treasurer

David Beecroft

Holdover Councilors

Term of 1932-1933

S. O. White
R. E. Wilson
H. T. Woolson

Past-President Members of Council

Vincent Bendix
A. J. Scaife

MEN OF MERIT

Society Urges Employers To Select Best Available Talent from S.A.E. Member Listings

MEN without positions are in good company these days. Some of the best engineering talent in the Country is available. Capable men are eager to get back into harness again; many of them bear the S.A.E. badge of distinction and merit. With a *Return to Reason* the industry will have vacancies to fill. The Society's Employment Service offers a free opportunity to bring men and positions together. The Service is prepared to recommend members who are qualified in all phases of the automotive and allied industries. A few sample qualifications are listed below. Use the S.A.E. Employment Service!

CAN YOU USE

A Metallurgist
of national repute, whose experience with ferrous and non-ferrous metals is a chronicle of success. Thoroughly familiar with all phases of physical, chemical and metallurgical laboratory work, he is also capable of the management of heat-treatment in all its ramifications, and with the production problem involved.

A Body Engineer
with two decades of experience, from draftsman to chief engineer, accomplished in the design and production of bodies for all types of automotive vehicle, including the development of designs involving the use of stainless steel.

An Aircraft-Engine Designer
project engineer—assistant chief engineer—chief engineer, his work is to be found in the designs of several of the best of present-day radial aircraft engines, including the new 14-cylinder, two-row radial engines.

A Transmission Engineer
who, as chief engineer of one of the foremost manufacturing plants, created and supervised designs of transmissions, clutches, power take-offs and controls for all types of motor-vehicle. His experience extends from gear design through four-speed transmissions.

A Truck and Trailer Engineer
thoroughly experienced in chassis design for trucks, motorcoaches and trailers. As chief engineer of one of the leading trailer-manufacturing plants, he has developed a complete line of tractor and trailer units.

An Operation and Maintenance Engineer
a superintendent of transportation, operations manager and maintenance engineer specializing in cost-reduction work. A man of over 20 years' experience in the field of motor-vehicle operation and control.

A Chief Draftsman
tool design — tractor layouts — gas-engine and Diesel-engine design and antifriction-bearing application — a versatility in experience beyond the average. Thirty years of drafting-room experience with companies of national reputation in the tractor, engine and machinery fields.

A Versatile Engineer and Executive
widely known for his successful connection with some of the industry's leading motor-car developments. He has won an enviable reputation also in coordinating engineering and production with advertising and sales in such a manner as to promote the technical values as business-getting factors.

An Airplane Designer
a chief engineer, internationally known for his work in the design and development of airplanes. His experience includes, as well, the design of motorboats and motorcoaches. For years he has been an outstanding figure in aircraft engineering and has produced plans used both in private and airline transportation.

An Engineering Consultant
with 20 years of engineering experience in the field of higher-priced cars. He is now available for consulting work or a full-time position where the services of a seasoned and progressive chief engineer or assistant chief engineer are needed.

An Engineering Executive
of 25 years' experience, whose work has carried him from assistant superintendent of production to president; a man thoroughly equipped with practical training in design, production and business management in many fields of automotive manufacture.

A Diesel-Engine Designer
whose reputation was developed through his experience in the design of ship machinery and Diesel engines for several famous shipbuilding companies, and during the war for the United States Shipping Board.

Meetings Calendar

General Meetings

Production Meeting—Oct. 3

Hotel Statler, Buffalo
In Cooperation with National Metal Congress and Exposition

Transportation Meeting—Oct. 4 to 6

Royal York Hotel, Toronto, Canada
Canadian Section to Be Host to the Society

Annual Dinner—Jan. 12, 1933

New York City.

Annual Meeting—Jan. 23 to 26, 1933

Book-Cadillac Hotel, Detroit

Section Meetings

Baltimore—Oct. 20

Hotel Emerson; Dinner 6:30 P.M.
Adaptation of Modern Trucks to Modern Industry—George H. Scragg, Executive of Brockway Motor Truck Corp.

Buffalo—Oct. 3

Hotel Statler
In Cooperation with the Production Meeting

Canadian—Oct. 4 to 6

Royal York Hotel, Toronto
In Cooperation with the Transportation Meeting

Chicago—Oct. 11

Bone of Contention Is Super-Balloon — B. J. Lemon, U. S. Rubber Co.
Low-Air-Pressure Tires—Burgess Darrow, Goodyear Tire & Rubber Co.

Cleveland—Oct. 10

Cleveland Club; Dinner 6:30 P.M.
What Modern Automobiles Could Be—William B. Stout, Stout Engineering Laboratories, Inc.

Dayton—Oct. 11

Shop Inspection Trip to Cincinnati

Detroit—Oct. 10

Book-Cadillac Hotel; Dinner 6:30 P.M.
At 8:30 P.M., simultaneous sessions of three activities as follows:
Body Activity—Streamlining (with slides and exhibits)—Herbert C. Winter
Aeronautic Activity—Large High-Performance Aircraft Engines of the World and Their Marine Adaptation (illustrated)—M. J. Steele
Production Activity—Diamond Precision Boring—W. F. Wise

Indiana—Oct. 13

Hagerstown, Ind.
Visit to Perfect Circle Co. plant in afternoon and meeting in evening, with informal talks on piston-ring problems and progress

Metropolitan—Oct. 6, 8 and 20

Oct. 6—Hotel New Yorker, North Ballroom; Dinner 6:00 P.M.
The Autogiro—James G. Ray, Autogiro Co. of America
Oct. 8—Visit to Newark Airport, Newark, N. J.
Oct. 20—Hotel New Yorker, North Ballroom; Dinner 6:00 P.M.
Research—H. L. Horning, Waukesha Motor Co.

Milwaukee—Oct. 5

Milwaukee Athletic Club; Dinner 6:45 P.M.; Entertainment
Field and Laboratory Fuel-Testing—W. M. Holaday, Standard Oil Co. (Indiana)

Northern California—Oct. 11

Elks Club, San Francisco; Dinner 6:30 P.M.
Aviation Meeting

Pittsburgh—Oct. 11

Fort Pitt Hotel; Dinner 6:00 P.M.—Entertainment.
Light-Weight Diesel Engines Versus Gasoline Engines for Automotive Service—H. L. Horning, Waukesha Motor Co.

Southern California—Oct. 1

Sunset Canyon Country Club, Burbank, Calif. Golf in afternoon; dinner 6:30 P.M.; meeting and dancing in the evening
Factors Governing Design of Military Observation Airplane—F. W. Herman, Douglas Aircraft Co.
Federal Airway Systems from a Pilot's Viewpoint—A. A. Barrie, Western Air Express

Syracuse—Oct. 10

Joint meeting with Technology Club of Syracuse

Council Appoints Walter C. Keys

Detroit Member Chosen To Complete Unexpired Term of F. S. Duesenberg as Councilor

WALTER C. Keys, an active member of the Society since 1915, was unanimously chosen to complete the unexpired term of F. S. Duesenberg, whose recent death terminated a long period of service to the Society and the industry. In appointing Mr. Keys at a regular meeting in Cleveland on Aug. 31, the Council gave recognition to his constructive work in S.A.E. affairs and welcomed him into further participation in the promotion of automotive engineering advancement.

1932-1933 Budget Adopted

Prior to the Council meeting, the Finance Committee, headed by David Beecroft and including as members W. L. Batt, C. W. Spicer, J. W. White and C. B. Whittelsey, had made a careful study of Society finances and prepared a set of budget recommendations which were submitted for Council action. Many economies already in effect were supplemented by others that will bring the business aspects of S.A.E. activities into line with present conditions of reduced income. In adopting these economies, the Council gave further expression of the policy of maintaining the essential services of the S.A.E. at the highest point consistent with good principles of management. To accomplish this objective, the Council approved a substantial expenditure from surplus funds.

It was voted that a nominal fee of $2 per copy should be charged for the 1932 TRANSACTIONS, which will be issued early in 1933; the purchase of TRANSACTIONS to be at the option of the members.

Section budgets were reviewed and final action was taken with respect to the new year's finances of the Society's 22 Sections.

New Members Approved

A favorable report on membership activities was heard and 128 new applications were approved.

Consideration was given to a number of special cases in which members have become confronted with adverse conditions beyond their control.

Appointments for Standards Work

Upon recommendation of Chairman Arthur Boor, of the Standards Committee, F. E. Holsten was appointed to serve on the Lubricants Division and the following members were chosen as a Special Committee on Brake Linings:

D. L. Gallup, *Chairman*

R. S. Begg	M. B. Morgan
W. A. Blume	W. F. Oliver
C. P. Brockway	C. F. Ogren
T. P. Chase	G. E. Pope
J. A. Lunn	R. H. Soulis

The next meeting of the Council will be held at Toronto during the Transportation Meeting early in October.

Host of New Members Join the Society

Cooperation of S.A.E. Workers Brings Gratifying Results

ALTHOUGH the final outcome of the Get-Your-Man enterprise will not be known before the end of the year, the results to date mark the campaign as a highly successful undertaking. Listed below are the names of members each of whom has already brought one or more well-qualified engineers into the Society's membership. Others who are being added to the list daily will be given credit in subsequent issues of THE JOURNAL.

The position of the Sections has varied somewhat during September, as will be noted from the accompanying table of their relative standing as determined from new members elected and paid up since the campaign started.

GET-YOUR-MAN HONOR LIST

(Each Man Listed Had Sponsored One or More New Members to Sept. 23)

Allen, Charles W.
Allen, George B.
Aug, William F.
Barnaby, Lieut.-Com. Ralph S.
Barnard, D. P.
Bartholomew, Earl
Beall, Wellwood E.
Beasley, W. F.
Bellingham, William James
Bicknell, G. M.
Blair, Benjamin H.
Boessenkool, Johan
Bower, Ferdinand A.
Cain, David A.
Chandler, Franklin F.
Chaskel, E. F.
Coleman, Alfred F.
Combs, R. H.
Cooke, Edward F.
Cox, Capt. Malcolm R.
Creamer, John F.
Culver, Edward P.
Davis, F. S.
Davis, R. S.
Davis, William Norman
Deturk, L. M.
Dresser, Dan L. R.
Du Bois, R. N.
Duesenberg, Fred S.
Edwards, James A.
Fahnestock, Murray
Fairhurst, William
Fales, Dean A.
Favary, Ethelbert
Fishburn, Otto E.
Flynn, James W.
Franks, J. B., Jr.
Franzen, Tore
Freeman, Frank P.
Garrett, Hugh C.
Gelpke, A.
Gerker, Bernard H.
Glynn, F. K.
Gregg, David
Hall, Robert Charles
Hardecker, John F.
Harder, D. S.
Hardin, R. F.
Hastings, Warren B.
Hawthorn, John S.
Hegeman, Bruce
Henry, Capt. S. G.
Herfurth, W. R.
Hersey, Donald S.
Holmstrom, John G.
Huckle, Myron Samuel
Hyde, Harlow
Jacklin, H. M.
Jacobsen, C. H.
Janeway, R. N.
Joslin, Leon Ray
Kelley, E. H.
Kennedy, Lieut. John P.
Kennedy, William P.
Keys, Walter C.
Kizer, H. W.
Krieger, C. G.
Lampe, Friedrich W.
Lay, Robert P.
Lee, Walter E.
Lemon, B. J.
LePage, W. Laurence
Lloyd, Reese
MacCoull, Neil
MacNeil, Charles I.
Matthews, Ralph R.
Mathis, Clyde C.
McFarlane, C. J.
Miller, Paul
Moreland, Watt L.
Murdie, J. A.
Neil, Edmund Brush
Newton, L. V.
Noville, G. O.
Olivier, H. C.
Paige, Edward C.
Panzegrau, Norman O.
Paton, Roy W.
Parks, Frederick William
Pooley, G. O.
Porter, L. M.
Rarey, Capt. George H.
Ratcliffe, J. G.
Retzlaff, W. G.
Riehl, Willis A.
Robillard, F. S.
Rodgers, Walter I., Jr.
Rollin, Vern G.
Roos, Delmar G.
Round, G. A.
Sainturat, Maurice
Salzman, George S.
Sanwald, G. Leonard
Scaife, A. J.
Schmidt, Herman H. A., Jr.
Schon, Pierre
Schonitzer, Rudolph
Smith, A. E.
Spengler, Walter J.
Stalnaker, Russell Howard
Stein, Fred W.
Stevens, G. C.
Stewart, Curtis C.
Stock, Edward W.
Stratford, Fred
Stuck, Charles J.
Swenson, A. S.
Talbot, James M.
Tattersfield, Ernest E.
Taub, Alex
Teetor, Ralph R.
Thatcher, Charles F.
Thornton, O. M.
Tilston, Charles E.
Underwood, A. J.
Walter, Edford M.
White, Samuel O.
Whitney, Maurice Page
Williams, V. P.
Winter, George William
Zucrow, Maurice J.

NEW MEMBERS OBTAINED

(Elected and Paid Up to Sept. 23)

SECTION STANDING

(Expressed in Percentage of Quota)

1	Philadelphia	30.2
2	Canadian	27.6
3	Indiana	27.4
4	Baltimore	24.3
5	Chicago	16.7
6	Kansas City	16.6
6	Northwest	
7	Southern California	16.0
8	Metropolitan	15.4
9	Detroit	13.5
10	Syracuse	12.1
11	Pittsburgh	11.6
12	Buffalo	7.9
12	Cleveland	
13	Washington	7.0
14	St. Louis	6.5
15	Northern California	6.0
16	Wichita	5.9
17	Dayton	5.4
18	Milwaukee	4.7
19	New England	2.5
20	Oregon	0

INDIVIDUAL STANDING

(For Individual Awards)

Tied for First Place

J. F. Hardecker — L. R. Joslin
L. M. Porter

Tied for Second Place

R. N. Du Bois	L. V. Newton
A. Gelpke	G. O. Pooley
F. K. Glynn	C. C. Stewart
R. N. Janeway	R. R. Teetor
C. C. Mathis	O. M. Thornton

Tied for Third Place

A. F. Coleman	C. G. Krieger
R. H. Combs	B. J. Lemon
J. G. Holmstrom	Reese Lloyd
C. H. Jacobsen	E. E. Tattersfield
W. C. Keys	Alex Taub

Chronicle and Comment

Men of Merit THE Society's badge of membership constitutes an index of professional standing that is not overlooked by alert men who are in quest of suitable talent for their engineering positions. In this connection, it is a significant fact that a great many key positions in the industry are held by S.A.E. members. To these men and others the Society offers every facility of its Employment Service. *Men of merit* are available and are eager to fill vacancies as they arise. The S.A.E. Employment Service has full information concerning their qualifications and is more than willing to cooperate with every employer who has an opening to fill.

Use the Employment Service and get the best men! A few *samples* are listed elsewhere in this issue of the S.A.E. JOURNAL.

Full Speed Ahead! ALL signals are set for full speed ahead with S.A.E. activities throughout the coming months. During September and October the Sections will get under way with programs that promise well for the new Section year.

In January, two important events will take place—the Annual Dinner in New York City on Jan. 12 and the Annual Meeting in Detroit, Jan. 23 to 26 inclusive. Committees are now at work to make these activities more noteworthy than ever.

The Society's officers insist that S.A.E. work must continue to progress in spite of obstacles; they have felt justified in maintaining every possible service to the membership; they have approved a "full speed ahead" attitude for the future.

Production Men Meet on Oct. 3 CARRIED in this issue of THE JOURNAL is an advance story of the Society's Production Meeting staged on Oct. 3 in Buffalo. Coordinated with the National Metals Congress and Exposition, the S.A.E. event constitutes an important part of a week's program of meetings held by the American Society for Steel Treating and other cooperating organizations.

Vice-President J. E. Padgett; Production Activity Meetings Committee Chairman Joseph Geschelin; M. A. Thorne, Chairman of the Buffalo Section, and cooperating members of the Committees and Section are among those who are receiving congratulations for the successful conduct of the affair.

Real Cooperation in Research A TRULY remarkable project of cooperative research has recently been completed by the detonation group of the Cooperative Fuel-Research Committee. Aimed at a correlation between road observations of knock and results obtained under laboratory conditions, the experimental work required some 10,000 observations during 2500 runs on Uniontown Hill, plus a great many additional determinations on the C.F.R. engines at Waukesha, Wis.

Although the test results, as reported in the Automotive Research department in this issue of THE JOURNAL, are in themselves of intense interest, the pleasing culmination of the project is more than significant as a demonstration of the possibilities for achieving an objective through *real cooperation* of capable men and substantial companies.

Credit for this enterprise is shared by a fairly large group, many of whom are mentioned in the account of the research. Special recognition should be given to T. A. Boyd, Chairman of the Detonation Subcommittee; A. L. Beall, Chairman, and H. F. Huf, Vice-Chairman, of the road-test sub-group; and Past-President H. L. Horning, whose consistent cooperation in the detonation work has been largely responsible for its success. It was through Mr. Horning's generosity that every facility and warm hospitality were made available to the research men during the experimental work at the Waukesha Motor Co.'s plant in Wisconsin.

Transportation Story Next Month ALTHOUGH this issue of THE JOURNAL includes technical material from the Transportation Meeting to be held in Toronto on Oct. 4, 5 and 6, the November number will report the event in considerable detail. Seldom if ever has the Society sponsored a more attractive program of features for transportation engineers. The November account will give ample evidence of this fact.

President Scaife Speaks DURING an extensive tour among our Sections early this year, President Scaife was able to inform many members of the vital facts and factors involved in present-day taxation and regulation of automotive transportation. In view of the widespread interest that has been shown in the subject by the engineering fraternity, President Scaife has permitted THE JOURNAL to print his views in this issue.

Voting Season Approaches HEADED by Dr. H. C. Dickinson, Presidential candidate, a slate of nominees for Society offices has been prepared by the Nominating Committees and is presented on p. 16 of this issue of THE JOURNAL. The qualifications and achievements of these outstanding members are well known to many members. Very brief summaries of their professional and S.A.E. activities are given on pp. 16 and 25.

Ballots, to be mailed in the near future, should be returned promptly so that the voters' choice may be announced at an appropriate time.

Regarding 1932 Transactions IN accordance with a recent decision of the Council, TRANSACTIONS for 1932 will be distributed only to those who are sufficiently interested in obtaining the volume to pay a nominal fee of $2 per copy. The new edition, to be mailed early next year, will contain the papers that have been printed in the issues of the S.A.E. JOURNAL from January to December inclusive.

Those who wish to receive the 1932 TRANSACTIONS should indicate their desire in the space provided on the annual dues bill.

Automotive Research

Correlation of Knock Ratings

Road-Test Method Developed and C.F.R. Laboratory Procedure Modified [1]

SATISFACTORY correlation between the knock intensities of fuels rated in cars on the road and the octane-number ratings of fuels as determined on the C.F.R. engine is the outcome of an intensive period of cooperative road and laboratory test work conducted under the direction of the road-test correlating group of the C.F.R. Detonation Subcommittee. This correlation has been made possible by the development of a method for making road knock ratings and by minor modifications in the C.F.R. apparatus and procedure, both of which received the approval of the Cooperative Fuel-Research Steering Committee at its recent meeting. The modified knock-testing procedure was officially designated as the C.F.R. Motor Method, with an order to retain the old method for experimental purposes under the title C.F.R. Research Method.

Need for Correlation Recognized

For some time the members of the Detonation Subcommittee, of which T. A. Boyd, of the General Motors Corp. Research Laboratories is chairman, had been aware of the need for investigating the problem of bringing laboratory knock ratings of fuels in closer agreement with the actual performance of fuels in cars on the road.

Early in 1932, a committee headed by A. L. Beall, of the Vacuum Oil Co., as chairman, was appointed as a sub-group of the Detonation Subcommittee to investigate this problem and to develop a road-test procedure. That Subcommittee rendered a report at the time of the Summer Meeting of the Society, with recommendations which included the suggestion that a larger, more representative subcommittee be formed to determine the average deviation of road-test results by the proposed method from results obtained by the standard procedure on the C.F.R. engine.

Road Tests Conducted on Uniontown Hill

Accordingly, a volunteer committee was formed which included in its membership representatives of 14 automotive and petroleum laboratories and continued under the chairmanship of Mr. Beall. The program of work laid out by that group, known as the Road-Test Correlating Sub-Subcommittee, provided that each cooperating company should send accredited representatives and trained operators to meet at Uniontown hill, Uniontown, Pa., on Aug. 3 so that a series of cooperative road tests on representative fuels and cars might be conducted to determine the significant road knock rating of a motor gasoline.

The official operating representatives of the laboratories engaged in this work were as follows:

H. W. Best	Yale University
F. C. Burk	Vacuum Oil Co.
J. M. Campbell	General Motors Corp.
A. L. Clayden	Sun Oil Co.
E. Dunning	Shell Petroleum Corp.
W. M. Holaday	Standard Oil Co. (Indiana)
G. A. Hope	Standard Oil Co. of New York
C. A. Kass	Standard Oil Development Co.
A. W. Pope	Waukesha Motor Co.
J. R. Sabina	Atlantic Refining Co.
C. B. Veal[2]	Society of Automotive Engineers, Inc.
L. B. Voshall	The Texas Co.
Cleveland Walcutt	Ethyl Gasoline Corp.
Gilbert Way	Chrysler Corp.
N. R. White	Bureau of Standards

[2] Secretary, Cooperative Fuel-Research Steering Committee.

Others present who assisted materially in the formulation and conduct of the tests were:

A. L. Beall, Chairman	Vacuum Oil Co.
H. F. Huf, Vice-Chairman	Atlantic Refining Co.
W. Anderson	Chrysler Corp.
J. G. Cook	The Texas Co.
B. W. Dickinson	Bureau of Standards
H. L. Horning	Waukesha Motor Co.
S. P. Marley	Vacuum Oil Co.
L. E. Rinker	Shell Petroleum Corp.

The Cars and Fuels Tested

Fifteen cars, including the popular makes and models now on the road, were tested. These were the Buick 32-67; Ford Model A; Ford V-8; Chrysler 8, 1932; Hudson 1932; Nash 1932; Oldsmobile 1932; Plymouth 1932; Studebaker President 1932; Dodge 6, 1932; Chevrolet 1932; Chevrolet 1932, high compression; Buick 1931; Chrysler 1931, high compression, and Studebaker 1930, high compression.

Fifteen fuels selected as representative of the entire range of commercial gasolines were used in the tests. The fuel samples were labeled with a system of letters and numbers, the key to which was known only to the Secretary of the Committee and which has since been destroyed to avoid any possible identification of commercial gasolines. The fuels included were a liquid-phase cracked gasoline, a vapor-phase cracked gasoline, a blend of 65 per cent of the above liquid-phase cracked gasoline and 35 per cent of the Reference Fuel A, a blend of 50 per cent of the above vapor-phase cracked gasoline and 50 per cent of the Reference Fuel A, and a group of commercial fuels known as the UT Series, which included Gulf, Tydol, Sunoco, Texaco, Atlantic White Flash, U. S. Motor, Amoco, Atlantic-Ethyl, Penreco-Ethyl, a cracked California and a straight-run California gasoline.

The road tests continued from Aug. 3 through Aug. 17. All results obtained represent the findings of at least two groups of men, sometimes of three or four groups, usually three men to a group. More than 2500 runs were made up the hill, and approximately 10,000 observations of knock were recorded. No individual laboratory has available enough trained experts to approach this quantity of work, even over a long period of time. Cooperative effort alone is responsible for the mass of data collected.

These data were carefully analyzed, tabulated and plotted. The graphs indicated knock intensities, knock ratings over the entire knocking range and maximum knock ratings. These data, boiled down into one chart, showed the maximum spread in ratings obtained on each fuel for each car and the average of maximum knock ratings for each fuel in each car.

Maximum Knock Ratings Significant

A study of these charts revealed three important findings:

(1) The spread of knock ratings, with the exception of three cars, was about 20 per cent of Reference Fuel C, or about 5 octane numbers for commercial fuels. For the straight cracked fuels, the spread was much greater. It should be understood, however, that the spread as plotted did not mean variation between groups but an actual spread in ratings observed under different methods of test.

(2) For the commercial fuels, the maximum knock ratings usually fall within the total spread.

(3) The knock intensity ratings, made in each case at the speed of maximum knock for each of the commercial fuels, fall within a comparatively narrow range representing a maximum spread of about 5 octane numbers. For the straight cracked fuels the alignment is not so good, but the total spread is also greater. The getting of a representative road rating for these straight cracked fuels appears to be a matter of the very roughest approximation because of the wide divergences between cars.

The average of the maximum knock ratings for all cars on each fuel was agreed upon as the most satisfactory road rating for the fuels tested that the operating group was able to determine.

Road-Test Procedure Developed

On the basis of these data, the following road-test procedure was approved and adopted by the Detonation Sub-

[1] All data taken from the unconfirmed minutes of the Sept. 12 meeting of the Cooperative Fuel-Research Steering Committee.

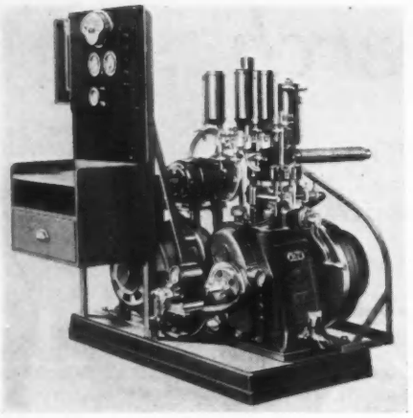


FIG. 1—THE STANDARD C.F.R. KNOCK-TESTING ENGINE IN THE FORM ADOPTED PRIOR TO THE UNIONTOWN TESTS

committee and later by the Cooperative Fuel-Research Steering Committee:

Road knock ratings on motor gasolines shall be made by a method involving a comparison between the sample to be rated and a reference fuel; this comparison to be made between the points of maximum knock of each fuel without regard to whether this point of maximum knock occurs at the same or different speeds for the sample and the reference fuel.

More specifically, in rating a fuel in a car by this method it is necessary to determine:

(1) The relative knock intensities produced by the sample at different speeds during either slow acceleration or slow deceleration

(2) The relative knock intensities produced by the reference fuels at different speeds during a similar period of slow acceleration or deceleration. From these data the speed required to produce the maximum knock intensity for each fuel, that is, the sample and the reference fuel, is determined

(3) Finally, the knock intensity produced by the sample at its speed for maximum knock is to be bracketed between knock intensities produced by two reference fuels at their maximum knock speed

The rating is then expressed in terms of a reference fuel which will produce a maximum intensity that matches the maximum knock intensity produced by the sample to be rated.

In making ratings by this method, it is to be understood that they are to be made at full throttle and within a speed range of 15 to 50 m.p.h.

Cooperative Laboratory Tests at Waukesha

The modification of the C.F.R. knock-testing apparatus and procedure to correlate laboratory results with the results obtained by the newly established road-test method was unanimously determined upon as the next step in the undertaking.

H. L. Horning, president of the Waukesha Motor Co. and an active member of the Detonation Subcommittee since its inception, generously offered complete facilities for conducting cooperative tests at the laboratory of his company. Accordingly, the second phase of the test program was started at Waukesha on Aug. 24, and by dint of the most concentrated efforts, operations being planned on a basis of two shifts per day, the operating group assigned to this problem brought its work to a satisfactory conclusion in time to render a report at the Sept. 12 meeting of the Co-operative Fuel-Research Steering Committee.

The correlation work at Waukesha was conducted with identically the same fuels that were used in the road tests at Uniontown, the remainder of the supply of fuels having been carefully transported by truck from Uniontown to Waukesha.

In accordance with the plan outlined at Uniontown to allow each organization participating in the work to be represented by one man, the following men and their respective organizations contributed to the work:

W. G. Ainsley	Sinclair Refining Co.
H. W. Best	Yale University
J. M. Campbell	General Motors Corp.
W. M. Holaday	Standard Oil Co. (Indiana)
K. L. Hollister	The Texas Co.
G. A. Hope	Standard Oil Co. of New York
L. A. Hunt	Ethyl Gasoline Corp.
C. B. Kass	Standard Oil Development Co.
S. P. Marley	Vacuum Oil Co.
T. B. Rendel	Shell Petroleum Corp.
G. C. Rodgers	Bureau of Standards
J. R. Sabina	Atlantic Refining Co.
C. B. Veal	Society of Automotive Engineers, Inc.
H. M. Wiles	Waukesha Motor Co.

In addition to these men, H. K. Cummings and N. R. White, of the Bureau of Standards, and K. T. Winslow and A. W. Pope, of the Waukesha Motor Co., rendered valuable assistance to the above-named operating group.

Changes in C.F.R. Apparatus

At the outset of the work, two changes in the standard C.F.R. engine as shown in Fig. 1, were adopted, as follows:

(1) A shrouded intake valve designed to give the charge a swirling motion as it enters the intake port

(2) An improved type of steam condenser and the elimination of the circulating pump

These two changes proved effective throughout the work and, on the recommendation of the operating group, were formally adopted by the Detonation Subcommittee and later approved by the Steering Committee. The engine in its changed form is shown in Fig. 2.

The first task before the laboratory operating group was to determine what degree of correlation existed between ratings made by the existing C.F.R. knock-testing procedure and the Uniontown road ratings. This correlation is shown in Fig. 3, in which the Uniontown ratings are plotted on the vertical axis against the C.F.R. ratings on the horizontal axis. Exact correlation between road ratings and laboratory ratings would be shown by points falling on the 45-deg. line midway between the two axes.

This chart shows a decided lack of perfect correlation and indicates that the average discrepancy between the C.F.R. engine ratings by the existing procedure and the road ratings was of the order of magnitude of 10 per cent of Reference Fuel C-6 in Reference Fuel A-2, or the equivalent of about 2.5 to 3.0 octane numbers for commercial fuels. In certain cases the discrepancy was greater.

Since these data established the fact that ratings made by the C.F.R. knock-testing procedure do not correlate with the road results, the problem resolved itself into one of modifying the existing C.F.R. procedure in such a way that more nearly perfect correlation could be obtained between the laboratory test and the road test. In making the necessary modifications, the Committee aimed to obtain the best correlation possible by the most practical means; that is, means which would involve the minimum amount of change in the existing equipment. An effort was made to reproduce normal automotive-operating conditions insofar as possible and to develop a method that would lend itself most readily to routine practice and by which knock ratings could be made on fuels varying in antiknock quality over a wide range.

With these principles in mind, certain engine operating variables, which several of the cooperating laboratories

TABLE 1—SUMMARY OF RATINGS ON FUELS TESTED AT UNIONTOWN[a]

	C.F.R. Research Method		Road Ratings		C.F.R. Motor Method	
Fuel	Reference Fuel C in Reference Fuel A, Per Cent	Equivalent Octane Number	Reference Fuel C in Reference Fuel A, Per Cent	Equivalent Octane Number	Reference Fuel C in Reference Fuel A, Per Cent	Equivalent Octane Number
RT- 9	95	75	77	70	74	70
RT-10	111	79	75	70	74	70
RT-11	66	68	54	64	55	64
RT-12	68	68	49	63	50	63
UT- 1	82	72	63	66	62	66
UT- 2	1	50	4	50	4	50
UT- 3	56	65	53	64	54	64
UT- 4	61	66	55	64	55	64
UT- 5	75	70	63	66	64	66
UT- 6	110	79	100	77	103	77
UT- 7	69	68	56	65	58	65
UT- 8	82	72	70	69	70	69
UT- 9	76	70	67	68	68	68
UT-10	103	77	94	75	88	73
UT-11	111	79	102	77	90	74

[a] The values are based on very limited calibration made at Waukesha and, while accurate within commercial limits, are subject to further check.

had previously found to be effective in modifying knock ratings, were selected; specifically, engine speed, mixture temperature, jacket temperature, throttle opening, valve timing and piston temperature. A study was made of the effect upon road-test correlation of changes in each of these variables, both singly and in various combinations.

Seven C.F.R. engines were placed at the disposal of the Committee at the Waukesha Motor Co.'s laboratory. Five of these engines were kept running constantly testing various modifications in the C.F.R. procedure. During the two and one-half weeks of test work, 68 modifications in procedure and approximately 650 individual knock ratings were made.

These tests constituted the major portion of the work, and as a result the following method was recommended as the most satisfactory from the standpoint of accomplishing good correlation with road ratings and without the attendant disadvantages of ethylene-glycol cooling which was included in the only suitable alternative method found:

C.F.R. Motor Method

The new C.F.R. Motor Method differs from the older method, now to be known as the C.F.R. Research Method, in five respects. It will be noted that the features of the new method as stated herewith involve certain definite changes in equipment and procedure. With the exception of these items listed below, the apparatus and procedure are essentially as published in the S.A.E. JOURNAL for August, 1931, and in use as the C.F.R. Research Method.

(1) Speed: 900 r.p.m.

(2) Mixture temperature: 300 deg. fahr.: heat applied by an electric heating-unit placed between the carbureter and the intake port; the mixture temperature to be measured by a mercury thermometer whose bulb is placed in the center of the mixture stream entering the inlet port

(3) Spark timing: 26 deg. before top center at 5:1 and following the present timing mechanism at other compression ratios

(4) Shrouded intake-valve

(5) An improved type of steam condenser and elimination of the circulating pump

Further in making the specified changes in equipment it is absolutely necessary that every new part of the equipment, including the complete electric heater, thermometer, shrouded intake-valve, and condenser and water connection to replace the circulating pump, should be specifically those manufactured for this purpose by the Waukesha Motor Co.

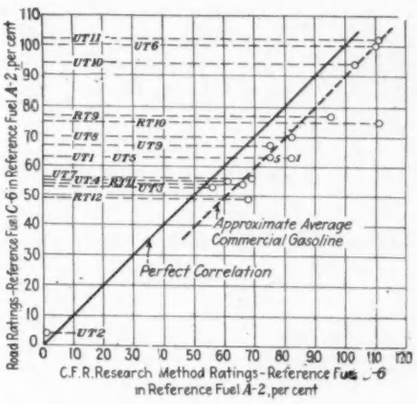

Road Ratings-Reference Fuel C-6 in Reference Fuel A-2, per cent
C.F.R. Research Method Ratings-Reference Fuel C-6 in Reference Fuel A-2, per cent
Approximate Average Commercial Gasoline
Perfect Correlation

FIG. 3—ROAD-TEST CORRELATION WITH C.F.R. ENGINE RATINGS DETERMINED UNDER C.F.R. RESEARCH METHOD

Test Conditions: Speed, 600 R.P.M.; Jackets, 212 Deg. Fahr.; Carbureter Set for Maximum Knock; Spark Timing, 22.5 Deg. at 5:1; Wide Open Throttle

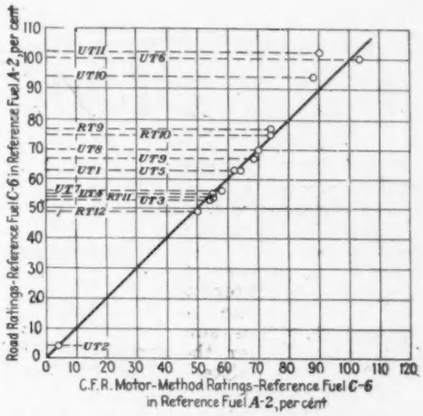

Road Ratings-Reference Fuel C-6 in Reference Fuel A-2, per cent
C.F.R. Motor-Method Ratings-Reference Fuel C-6 in Reference Fuel A-2, per cent

FIG. 4—ROAD-TEST CORRELATION WITH C.F.R. ENGINE RATINGS DETERMINED UNDER C.F.R. MOTOR METHOD

Test Conditions: Electric Mixture-Heater No. 2, Mixture, 300 Deg. Fahr.; Speed, 900 R.P.M.; Jacket, 212 Deg. Fahr.; Carbureter Set for Maximum Knock; Spark Timing, 26 Deg. at 5:1; Wide Open Throttle

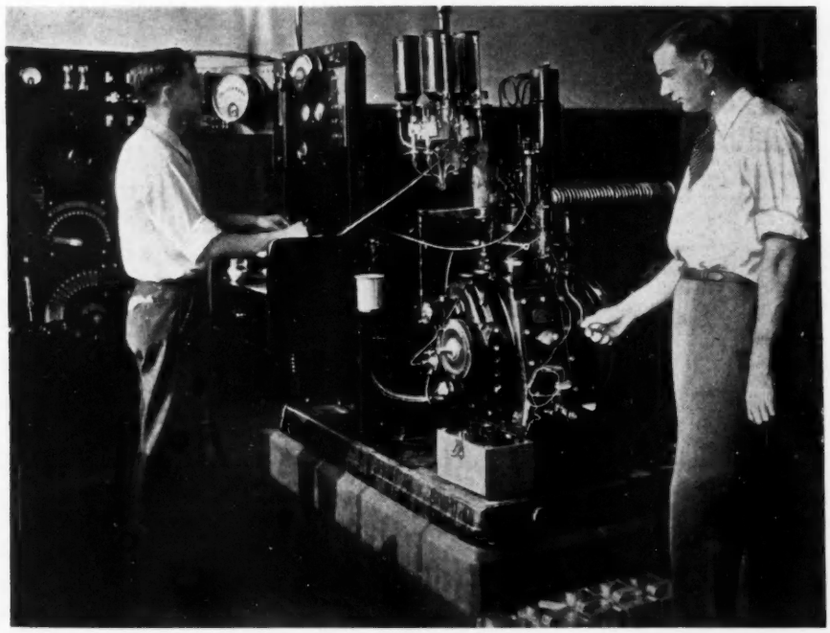


FIG. 2—THE MODIFIED C.F.R. ENGINE WITH SHROUDED INTAKE-VALVE, IMPROVED TYPE OF STEAM CONDENSER AND ELECTRIC MIXTURE-HEATER

Fig. 4 shows the correlation between road ratings and ratings on the C.F.R. engine determined by this modified procedure. Table 1, giving the summary of ratings on the fuels tested at Uniontown, indicates clearly the almost perfect correlation between the road ratings of the fuels and the laboratory ratings according to the modified procedure, now termed the C.F.R. Motor Method, and shows the degree of improvement in this correlation over the ratings as obtained by the previous method, that is, the C.F.R. Research Method.

Furthermore, the operating group, in rendering its report to the Detonation Subcommittee, expressed the belief that these modifications in the C.F.R. apparatus and procedure not only give better correlation with the actual performance tests than the former C.F.R. procedure, but the modified procedure will enable knock ratings to be made with greater speed and accuracy than heretofore.

Acting upon the report of the operating group and the recommendation of the Detonation Subcommittee, the Cooperative Fuel-Research Steering Committee. at its meeting on Sept. 12. officially approved this modification of the knock-testing procedure. to be known as the C.F.R. Motor Method.

The Steering Committee also approved the suggestion of the Detonation Subcommittee that the old C.F.R. method should not be discarded, since it is one on which considerable experience and data have been obtained and undoubtedly has value from the experimental standpoint, but should be retained under the title, C.F.R. Research Method.

Standardization Progress

Survey of Screw-Thread Practice

Preliminary Report on Extent of Adherence to Standards and Range of Accuracy

RESULTS of the survey of screw-thread practice in this Country, undertaken early last year, are nearing completion and promise interesting and valuable information. This survey, made under the direction of the Sectional Committee on the Standardization of Screw-Threads that is sponsored by the Society and the American Society of Mechanical Engineers, includes the careful measurement of screws, bolts, nuts and threaded parts and checking the extent to which they agree with the American Standard screw-threads. The following preliminary report is issued at this time for the general information of industry and will be followed later by a more detailed analysis of the results of the survey.

Survey of Screw-Thread Practice in the United States[1]

Introductory Information

The American National Standard for screw-threads for bolts, machine screws, nuts and tapped holes has been available for over 10 years. These standards are embodied in Section III of the Report of the National Screw-Thread Commission, in American Standards Association Report No. B1a-1924 of the Sectional Committee on the Standardization and Unification of Screw-Threads, in the S.A.E. HANDBOOK, and in Department of Commerce Commercial Standard CS24-30.

To obtain some measure of the extent to which these specifications are used and to which the tolerances are actually maintained, a survey has been conducted by the Sectional Committee on Standardization and Unification of Screw-Threads, of which Ralph E. Flanders is chairman, with the Bureau of Standards cooperating.

In addition to various other pertinent details, this survey was undertaken to show:

(1) The actual state of screw-thread standardization in the United States at present
(2) The range of accuracy desirable for an acceptable product of a given class
(3) The range of accuracy commercially attainable

This preliminary report of the survey will cover only the three foregoing features. A more complete report is now being prepared which will cover in detail the many significant and interesting features brought to light by this survey.

A list of firms from which samples of threaded product were to be obtained was made up by the Subcommittee on Screw-Thread Survey. The list was carefully made with the object of including different interested groups and industries, with a proper proportion of users and manufacturers, and also of large and small producers. The samples were selected on the basis of the normal product of the firm supplying them. In most cases, five samples of each size available of 12 predetermined sizes were selected; 7 sizes from the coarse-thread series and 5 sizes from the fine-thread series. In some cases, studs threaded at both ends were secured. In this report, each threaded end is listed as a separate sample.

The Committee's field representative recorded on suitable forms, at the time a group of samples was obtained, the size, material, intended class of fit and method of threading the individual samples. Definitely correlated with the samples was information as to the standard worked to, namely, the American National, U. S. Standard, and so on, and whether the threaded product was manufactured there or purchased. These samples were sent to the Bureau of Standards where they were measured and classified. The samples were not only checked with gages but also various individual elements of the threads were measured. The samples were then classified in two ways: first, the classification by gaging and, second, the classification by all measurements. In this preliminary report, the classification by gaging only will be considered, as such a classification represents best the normal inspection methods in industry. The classification by all measurements showed a slightly greater number of rejections because of faults in major and minor diameters, angle of thread, lead of thread, and so forth, than that by gaging alone, but in general the agreement between the two methods was very close.

Extent to Which the American National Standard Has Been Adopted

In most cases the samples received were designated in one of three ways:

(1) As a definite class of the American National Standard
(2) As U. S. Standard or Commercial
(3) With no definite class number or with special tolerances, many of them for stud fits

Only those in the first group which were specified as a definite class of fit can be accepted as samples definitely striving to meet the specifications of the American National Standard. The numbers of samples falling into the two groups, namely, American National Standard and Commercial or Unclassified, are shown in Table 1.

If the survey gives a fair measure of screw-thread practice throughout this Coun-

TABLE 1—CLASSIFICATION OF SAMPLES OBTAINED IN SCREW-THREADS SURVEY

Size	American National Standard	Commercial and Unclassified	Total	American National Standard	Commercial and Unclassified	Total
	Screws, Coarse-Thread Series			*Nuts, Coarse-Thread Series*		
6–32	155	155	310	119	95	214
10–24	175	159	334	129	118	247
3/8–16	398	325	723	318	238	556
1/2–13	382	325	707	315	220	535
3/4–10	336	272	608	271	206	477
1–8	238	201	439	203	169	372
1 1/4–7	155	95	250	150	61	211
Total	1,839	1,532	3,371	1,505	1,107	2,612
	Screws, Fine-Thread Series			*Nuts, Fine-Thread Series*		
3/8–24	204	89	293	175	74	249
7/16–20	145	45	190	128	50	178
1/2–20	142	80	122	157	70	227
5/8–18	127	40	167	147	48	195
1–14	43	10	53	79	15	94
Total	661	264	925	686	257	943
	Total, Coarse and Fine-Thread Series					
Total	2,500	1,796	4,296	2,191	1,364	3,555

[1] This preliminary report was prepared for the Subcommittee on Screw-Thread Survey by Prof. Earle Buckingham. The members of this Subcommittee are R. E. Flanders, chairman; C. W. Bettcher and E. Buckingham.

try, it would appear that the American National Specifications have been adopted for about 55 per cent of the Coarse-Thread Series product, for about 72 per cent of the Fine-Thread Series product, and for about 60 per cent of the total product of both series.

Degree of Success Attained in Meeting the Standards

Numerous tables and charts have been made in the study of the data obtained from the measurement of the 8000 samples. A study of these shows that a little less than one-half of the samples met the specifications. This, of course, represents the average of good, indifferent and poor conditions. In many cases, practically all of the samples received from a single source met the specifications, while, on the other hand, in a few cases, practically none of the samples received from a single source met the specifications. Again, some of the nuts listed as small, particularly in the sizes over ¾ in., met all specifications except for too small a minor diameter. Evidently in such cases the specified clearance for the minor diameters of tapped holes has been ignored.

Space limitations at this time will not permit of a more detailed discussion of phases of the study. The full report will show the classification by type of industry, the comparison between cut and rolled threads, manufactured and purchased threaded product, and the like, all of which should give a more complete picture of the present state of the art of making screw-threads.

Range of Accuracy Attained in the Production of Screw-Threads

When all of the 7851 threaded samples of screws, studs and nuts received are classified and tabulated on the basis of the highest classification into which they would fall regardless of the specifications to which they were made, those too large for any classification being listed as "Large" and those too small for any classification being listed as "Small," 6074 of the samples, as checked by gages, fall within some classification of the American National Standards. Assuming that these samples give a fair measure of industrial requirements for threaded products, it would appear that the range of accuracy covered by these standards was satisfactory. Whether or not the subdivision of this range of accuracy into the several fit classes can be improved must be determined by a much more detailed study of the information gained in this survey.

A study of these data now available reveals much interesting information. Although Class 1 has been specified but seldom, it will be seen that about one-fifth of the product, 17.2 per cent, falls with this class. To summarize, we have

17.2 per cent falls in Class 1
20.5 per cent falls in Class 2
29.9 per cent falls in Class 3
9.8 per cent falls in Classes 4 and 5
17.4 per cent is oversize or large
5.2 per cent is undersize or small

The thanks of the Sectional Committee and industry in general are due to the 128 firms which so generously contributed samples of screw-thread product for this investigation. The Committee thanks also the 8 firms which loaned screw-thread gages of various kinds to facilitate the measurements.

The expenses of the screw-thread survey are being met jointly by the Bureau of Standards and the Sectional Committee. The Committee's part thereof in turn has been subscribed by the Engineering Foundation, the United States Machine Screw Service Bureau and 36 firms which manufacture and use screw-threads. The S. A. E. and the A. S. M. E., as joint sponsors for this project, have assisted in many ways.

Dickinson Nominated for S.A.E. Presidency

(*Continued from p.* 16)

motor-vehicles, Standard Oil Co. of New Jersey since 1913. Elected to Member grade in the Society in 1919. Councilor, 1926-1927; member, Highways Subcommittee of Standards Committee, 1926-1928; member, Meetings Committee, 1927-1928; member, Operation and Maintenance Committee, 1927-1928; member, Research Committee, 1927-1932; member, Cooperative Fuel-Research Committee, 1928-1930; member, Transportation Committee and Transportation and Maintenance Committee, 1929-1932; Vice-Chairman, Transportation and Maintenance Committee, 1930; member, Ordnance Advisory Committee, 1929-1932; member, Military Motor-Transport Advisory Committee, 1931-1932; member, Automotive-Transport Code Committee, 1932; member, Publication Committee, 1930; member, Highways Subcommittee, 1930-1932; member, Motorcoach and Motor-Truck Division, Standards Committee, 1932.

W. T. Fishleigh.—Consulting engineer, Detroit. From 1914 to 1917, professor in engineering department, University of Michigan, and from 1920 to 1930, engineer, Ford Motor Co. Elected to Member grade in the Society in 1913. Member, Research Division, Standards Committee, 1913-1917; Chairman, Engine Division, Standards Committee, 1917; member, Passenger-Car Division, Standards Committee, 1926-1928; member, Tire and Rim Division, 1928; Councilor, 1929-1930; member, Constitution Committee, 1929-1931; member, Sections Committee, 1929; member, Passenger-Car Activity Committee, 1930-1932; Vice-Chairman, Detroit Section, 1926; Chairman, Detroit Section, 1928.

Dr. G. W. Lewis.—Director of aeronautic research, National Advisory Committee for Aeronautics. From 1917 to 1920 was in charge of internal-combustion-engine research at Clarke Thomson Research, Philadelphia, under direction of the N.A.C.A. Made executive officer of the N.A.C.A. in 1921 and has been director for about 10 years. Elected to Member grade in the Society in 1918 and later transferred to Service Member grade. Member Aircraft Activity Committee, 1929-1932; Chairman Aircraft Activity Committee, 1931; member, Aircraft-Engine Activity Committee, 1931-1932; member, Research Committee, 1931-1932; member, Publication Committee, 1931-1932; Vice-President, representing aircraft engineering, 1931.

W. G. Wall.—Consulting engineer, Indianapolis, for about 10 years. Previously chief engineer and vice-president, National Motor Car & Vehicle Corp. for a number of years. Elected to Member grade in the Society in 1906 and served as President in 1928. Councilor, 1910-1911; member, Finance Committee, 1910; member, Nominating Committee, 1910-1912; member, Publication Committee, 1912-1914; member, Motor-Testing Division, Standards Committee, 1913; First Vice-President, 1913, 1914, 1915 and 1927; Second Vice-President, representing motor-car engineering, 1920; member, Transmission Division, Standards Committee, 1919; member, Constitution Committee, 1927-1928; member, Ordnance Advisory Committee, 1920-1932; member, Transmission Division, Standards Committee, 1919-1920; member, Storage-Battery Division, Standards Committee, 1922; Chairman, Ordnance Advisory Committee, 1924-1927; member, Stock-Car Contest Advisory Committee, 1928-1932; Chairman, Indiana Section, 1911-1912.

D. Beecroft.—Manager New York City office, Bendix Aviation Corp. Assistant editor and editor *Motor Age*, managing editor, Class Journal Co., 1904-1929; vice-president Bendix Corp., 1929. Elected to Member grade in the Society in 1911 and served as President in 1921. First Vice-President, 1918; Chairman, Meetings Committee, 1917-1920; Councilor, 1919; member, Advisory Board on Highway Research, National Research Council, 1922; Chairman, House Committee, 1925; member, Membership Committee, 1927; Chairman, Finance Committee, 1931-1932; Chairman, Publication Committee, 1931-1932.

*Present at meeting of Nominating Committee, Jan. 26, 1932.

S.A.E. Nominating Committees 1932

(To Select Officers and Councilors for 1933)

Annual (To Nominate President, Treasurer and Three Councilors)

*Orrel A. Parker, Parker Wheel Co., Chairman (Cleveland Section)
*George P. Dorris, Consulting Engineer, Secretary (St. Louis Section)
*George O. Pooley, Chesapeake & Potomac Telephone Co. of Baltimore City (Baltimore Section)
Merritt L. Fox, Houde Engineering Corp. (Buffalo Section)
*R. H. Combs, Prest-O-Lite Storage Battery Co. (Canadian Section)
L. V. Newton, Byllesby Engineering & Management Corp. (Chicago Section)
*Vincent G. Apple, Vincent G. Apple Laboratories (Dayton Section)
*George Allen, Dodge Bros. Corp. (Detroit Section)
*W. Carleton Starkey, L. G. S. Devices Corp. (Indiana Section)
R. H. Van Ness, City Ice Co. of Kansas City (Kansas City Section)
*H. V. Middleworth, Consolidated Gas Co. of New York (Metropolitan Section)
*J. F. Max Patitz, Allis-Chalmers Mfg. Co. (Milwaukee Section)
Knox Brown, Packard Motor Car Co. of Boston (New England Section)
*E. C. Wood, Pacific Gas & Electric Co. (Northern California Section)
Valentine Gephart, Valentine Co. (Northwest Section)
H. W. Drake, Portland Gas & Coke Co. (Oregon Section)
*E. B. Neil, N. W. Ayer & Son, Inc. (Philadelphia Section)
Murray Fahnestock, *Ford Dealer and Service Field* (Pittsburgh Section)

(*Concluded on p.* 31)

Production Engineering

Body-Die Development

Considerations Involved as Outlined by F. L. Fralick[1] in His Semi-Annual Meeting Paper

DIE engineering goes farther than the mere conception of the design of a part that is to be manufactured, according to Mr. Fralick. In his opinion little thought seems to be given to the amount of engineering that must be done or to the time needed to commercialize an idea. The time element constitutes the one almost unsurmountable problem. Engineering changes in line with improvement of the product and lack of consideration of the difficulties they involve cause the die maker to travel an ever-changing pathway. To follow this pathway rapidly, it should be realized that the die maker must make every minute count. The paper covered quantity production of bodies.

In the art department of an automobile-body plant, artists trained in the blending of lines with graceful curves work out with modeling clay new ideas in design, trying to strike just the right combination that will enable a final decision to be reached. The idea of a beautiful automobile body then begins to be a reality. The engineering department must then produce from this design a manufacturing draft which shows details of construction and assembly. Every artistic line and curve must be dimensioned and the method of assembly established. From this picture, parts drawings are made, and the starting point has been reached at which material substances such as wood, cast iron and steel must be dealt with. Every line, curve and contour must be reproduced in metal so that none of the beauty of design is lost. The die-maker's problem, according to the expectations of the engineers and inspectors, is to make tools to perform in such a versatile manner as to be practically human.

Die Making Is Complicated

To the body-engineer's mind, each part or design is just that one thought or design and no more; but to the die maker it means a number of designs, depending on the part and what die operations accomplish the result, each requiring long thought based on experience. For example, a modern all-steel body requires the designing of approximately 125 parts, but also requires 550 die designs or operations.

Automobile-body dies probably vary more in design and detail than any other line of stampings. Such dies range in weight from a very few pounds to dies weighing 25 to 30 tons. Included with such difficulties are the vagaries of the body-engineer's mind, which has tried to combine beauty of line with strength and lightness without giving thought to the die-maker's problems.

Body die-building requires a knowledge of the action of steel under pressure; that is, the flow of cold metal. From a flat sheet must be formed all of the intricate shapes, ornamental beads and reveals common to automobile-body design, with buckles or strains eliminated. Panels must come from the dies uniform in all respects, day after day, with necessary hand finishing reduced to the minimum. Each die operation, the design of which must be coordinated with some other, must take into consideration not only the construction of the die proper but the results of its use on the metal being formed, until operation after operation finally produces a complete part, accurate in all details, ready for assembly and matching all relative parts.

A few years ago the die-building part of automobile-body construction was comparatively small. The body was composite; it had a substantial wooden frame with metal panels nailed on, the joints being acetylene-welded or covered with moldings. The panels were drawn or formed only, then were marked by hand and band-sawed. In many cases they were formed over hand-hammer fixtures; power hammers, ding men and plenty of solder were utilized to turn out a presentable looking body. This method of construction is still in vogue in custom body-building, in which, because of the small production of a given design, a large number of dies and tools is prohibitive.

Production of an All-Steel Body

In an all-steel body, the only wood used is for tacking trim or in places for which no substitute material has been found as yet. Its complete elimination is not far distant, be the substitute plastic material or steel.

Consider the all-steel underbody made with dies in one complete unit from a solid sheet of steel, comprising floor pans, sills and seat pans and eliminating all assembly. From this foundation arises an all-steel frame consisting of pillars and braces, designed and constructed to give the utmost strength and rigidity, solidly welded together until a structure is produced that is to all practical purposes one piece. Over this is slipped a sheet-metal shell consisting of outside body-panels on which all operations have been completed with dies that have been refined to give the utmost perfection of surface to bring out the beauty of an automobile body.

The automobile-body trend is each year more and more toward usage of steel and streamlines, which taxes the die builder to the limit of his resources. The experimental period has long passed. With imaginative powers still active each year, new problems arise until die builders ask where the body engineers will stop in their demands on steel for multifarious uses. It is hoped that this progress will be never-ending. While remarkable strides have been made in the formation of sheet steel with dies, this industry has just started. Sheet-steel manufacturers vie with one another in attempting to develop a more homogeneous metal. With their experience and ability to give body builders metal to stretch in dies, maintaining a satisfactory surface is the only recognized difficulty. To what length of development sheet steel can be formed or stretched for the present is known; for the future, it is guesswork. Money must be appropriated by manufacturers for experimental die-work to eliminate the guessing.

Necessity for Cooperation Stressed

In the conception of a new body-model in which the design is not ordinary and something different is wanted that possibly requires a new conception of construction, the body builder should consult the die maker; then, with the resulting combined efforts and understanding, its possibilities as a productive part can be comprehended. The right type of die executive will not always say "It can't be done." He will often give constructive criticism.

The time element is always paramount. Die engineers must be given time. True, one can duplicate a die or tool with rapidity and within a definitely stated time; however, to determine the period between the start and finish, handicapped by the hazard of guessing, is almost impossible and likewise costly.

Formerly, very few companies appreciated the necessity for experimental die-work. Money is appropriated by the millions for experimental purposes for the improvement of the automobile. Naturally, through the medium of these improvements, one speculates on the return on the investment, yet improvements of a die or tool are just as important. The return is positive. The expenditures for an experiment never are a total loss.

Body engineers must recognize that the ability of a die or tool to draw, shape or form metal is the answer to the question as to the extent to which intricate body shapes can be formed in production. By utilizing methods or principles that have been tested in practice, adding thereto the theory decided upon and then putting the combination of theory and practice into construction, the die builder can ever add to the experience of die-making and its products. The body engineer should not become discouraged at a possible suggestion by

(*Concluded on p.* 31)

[1] Die engineer, Briggs Mfg. Co., Detroit.

News of the Sections

Roads and Insurance Discussed

Northwest Section Resumes Meetings with New Officers and Interesting Topics

MEETINGS of the Northwest Section were resumed, following a summer suspension, with the first meeting of the new season held in Seattle on Thursday evening, Sept. 8, at the Dolly Madison cafe. Two topics closely akin to the automobile — highways and insurance — were discussed.

"There would be no automobiles without roads," explained C. C. Finn, Section Chairman, who delivered the principal address, on the subject, Highways and Taxation in the State of Washington. Insurance rates, he said, must be kept low enough or the industry will be crippled. He considered both subjects of paramount concern to engineers.

F. W. Bert, Jr., spoke on Insurance, paying particular attention to the determination of rates, which he said are based on experience of accidents and the settlement of damage claims.

Chairman Finn appointed John Holmstrom, who won high merit in the recent S.A.E. membership drive, as Chairman of the Section Membership Committee. Sherman Bushnell was appointed Chairman of the Program Committee. Al Oberg, the new Treasurer, and J. H. Frink, the new Secretary, as well as Sherman Bushnell, the new Vice-Chairman, were present to assume their duties.

Why Insurance Rates Increase

Insurance rates on motor-cars, especially for liability insurance, were increased, declared Mr. Bert, because experience indicated that the insuring companies were operating at a loss at the former lower rates. Increased horsepower and the multiplicity of cars, improved highways that invite higher speed, and the more constant use of cars were given as reasons for the greater number of injuries and damages. The increase in accidents, he stated, is approaching a serious condition, 90 per cent involving experienced drivers. Mr. Bert advocated a financial-responsibility law in Washington, requiring every car owner to take out a personal-liability bond or insurance. This, in his opinion, would result in lower liability-insurance rates.

Motor Taxes Needed for Highways

Mr. Finn, who has long made a study of highways in the State of Washington, attacked the plans of some to divert the State gasoline-tax revenue to uses other than for highway maintenance or construction. Of the 5-cent tax, about two-fifths is returned to the counties. This will amount, it is estimated, to about $4,600,000 for 1932. About $4,000,000 is required for highway maintenance. Of the estimated $14,000,000 annual income from gasoline taxes and motor-license fees, about $5,000,000 is all that remains for paving or new-road building. To divert this to other funds, when the total tax revenue of the State is $80,000,000, said Mr. Finn, would mean almost nothing as a tax reduction but would cripple the highway program and throw many more persons into the unemployed ranks.

That Washington is paying for its roads as it goes along he considered very important from a financial and economic point of view. Building slowly, year by year, also enables the highway engineers to make use of the latest improvements and developments and to take advantage of experience as to where roads should be located.

According to Mr. Finn, Oregon has spent $21,000,000 more on roads than Washington in the last 15 years, yet Washington has much more completed highway. He referred to the new pavement at two places in Washington, which, because of the method of laying, is believed to be vibrationless.

Asahel Curtis, well-known advocate of good roads, mentioned the damage done by trucks to roads not built for heavy-duty service. Overloading and solid-tire equipment, now rapidly passing out of the picture, were principally blamed. Concrete 2 in. thicker than formerly is laid on the State highways to take care of truck and motorcoach requirements, he declared.

"Trucks in the past have too often been built without any consideration whatever for the roads," commented Mr. Finn, who pointed out that the modern pneumatic-tired truck is a different piece of equipment from the old road-wreckers.

Northern California Section Begins Work Auspiciously

DINNER at the Elks Club, San Francisco, preceded the opening meeting of this Section on Sept. 13, at which 75 members and guests were interested in the presentation of two important maintenance papers and the discussion which followed. S. B. Shaw, of the Pacific Gas & Electric Co., was in charge.

Fleet-Maintenance Cost-Reduction

Reducing Fleet Maintenance Costs, the subject presented by Van W. Dennis, of the Pacific Telephone & Telegraph Co., included a summary of the shortcuts and ideas that are being used by fleet operators in the Sacramento section of California, gave reasons why they all are using methods and devices that they frowned upon a few years ago and explained how this has been brought about. Valve reseating, cylinder resleeving, governors, air-cleaners, oil reclaiming, tire retreading, use of four-ply tires, education of drivers, self versus outside maintenance and preventive-maintenance inspection methods were the main subjects covered.

In his paper on Motorcoach Maintenance, R. M. Ahrens, of the Pacific Greyhound Lines, first gave a brief description of the work required of the equipment maintained by his company. At present, he said, these lines operate about 380 motorcoaches over 8325 miles of highway. The territory served by the four main lines is bounded by Portland, Ore.; Salt Lake City, Utah; and El Paso, Tex. Elevations attained are 4522 ft. on the Pacific Highway, 4223 ft. on the Valley route to Los Angeles, 7135 ft. on the Salt Lake City operation and 5294 ft. on the southern route to El Paso, which also runs below sea-level for some distance. The company's operation averages about 53,483 miles per day.

Mr. Ahrens described certain special shortcuts and methods peculiar to the company's system which are followed in the three main service shops at Portland, Oakland and Los Angeles. Some of the subjects he treated were: rebuilding of cylinder heads on blocks, the maintenance and reclaiming of clutch plates and the reclaiming of differential carriers and spark-plugs.

The constant and ultimate aim of the department head who handles repairs and replacements is to keep down the cost per mile of operation. In compiling statistics of this cost, all charges against maintenance are divided into 30 distinct classes. As statements are made up each item of the 30 classes can be compared directly with previous statements and a finger put directly on those items showing undue rise and serving to keep the total-cost-per-mile figure high. He then discussed in some detail and illustrated a few of the methods developed and used in the three main shops, which greatly aid in retarding any advance in costs.

Major Points of the Discussion

J. C. Bennett, of the Associated Oil Co., who discussed both papers, favors the mileage basis of operation and the use of independent shops for repairs. The problem is for the fleet owner to educate the public-shop owner as to what the fleet owner wants. Most of the oil company's equipment averages about 2000 miles per month. The principle followed is to keep sufficient vehicles on hand to take care of normal peak loads; for excess peak loads, other means are provided to keep all equipment in use. The average time per lay-off is 1 day in 77 for a given vehicle in the shop.

R. H. Stalnaker, of the State Division

of Highways, said that 95 per cent of their repair work is done in their own shops. They use four-ply tires. W. C. Bendel, of the San Francisco Municipal Railways, stated that his company had very favorable returns from retreaded tires when the carcasses were in good condition. Their greatest trouble is with clutches and transmissions.

A synopsis of problems met in Portland, Ore., caused by excessive heating on account of the steep grades that almost surround the city was given by E. Dagner, who was formerly with the Fageol Motor Sales Co. in Portland. Engine blocks crack and exhaust valves burn, he said.

C. R. Stanley reported progress made by the Pacific Gas & Electric Co., of San Francisco, in building up valve-seats by the welding process and also discoursed on spark-plugs, cooling, dilution and on ignition-cable trouble, which causes a large percentage of road failures. E. C. Wood, of the same company, stated that the vehicles are governed to a speed of 35 m.p.h. His company believes that the electric form of welding is coming into greater prominence. Other practices are to retread tires and to reclaim oil.

Some of the other points covered by various discussers related to using special gasoline and changing the compression ratio for high-altitude operation, developments in line with improvement in upper-cylinder oiling to prevent engines from running too cool and causing raw gasoline to accumulate on cylinder walls and causes of road failure.

Nomination of Sections Officers

The Section's Nominating Committee reported nominations as follows: Chairman, A. B. Domonoske; Vice-Chairman, S. L. Boukard: Vice-Chairman for East Bay, J. M. Evans; Vice-Chairman for Aeronautics, J. F. Long; Secretary, W. S. Crowell; Treasurer, C. J. Vogt; Membership Committee Chairman, S. L. Boukard; Program Committee Chairman, S. B. Shaw and Reception Committee Chairman, Harry LaFleur.

An interesting schedule of programs was announced for future meetings during the year.

Stout Tells Met. Section How Aviation Can Help Cars

ABOUT 130 members of the Metropolitan Section turned out on the warm evening of Sept. 22 to inaugurate the 1932-1933 program of the Section and were amply repaid by William B. Stout, the speaker of the evening, who gave an interesting address on the subject, What Aviation Can Do for Motor-Cars.

The meeting was held at the Hotel New Yorker, which is to be the headquarters for the activities of the Section for the new season.

Mr. Stout got away to a flying start by narrating his dialect story about the "sons of Norway," and, having thus established himself with his audience, which hardly was necessary, as most of those present had heard him speak before and had attended the meeting to hear him again, he got down to the serious business in hand.

Cannot Camouflage Aircraft Engineering

The speaker analyzed the apparent lethargy of the automobile industry, and that of other industries too, making use of the experiences of the aviation industry to point out mistakes that became obvious to everyone as Mr. Stout told about them, but that had existed for a long time and will, he predicted, continue to exist in the future.

In support of this prediction, he quoted from a 1919 issue of THE JOURNAL, in which similar indictments had been made in two articles, one directed at the automobile and the other at the airplane. That the aviation industry has heeded its warning while the automobile people have failed to heed such advice cannot be denied.

A few of the important points made by Mr. Stout are of particular interest. He pointed out the basic difference between the type of engineering which goes into the designing of an automobile and that which goes into the manufacture of aircraft, saying that an automobile can be made up of the "world's worst" engine, chassis, body, tires and so on and not only will run, but people will buy it. On the contrary, airplane engineering cannot be camouflaged; if it is too heavy, it will not get off the ground. Furthermore, not only the individual features of aircraft design, such as aerodynamic outline, structure, power, balance and spin characteristics, must be correct in themselves, but the whole must be a coordinated design. After a ship has been put through its preliminary tests and comes up for its load test, said Mr. Stout, it generally is necessary to get out the Flit gun and chase out "bugs"; but try to get an automobile man to do the same thing!

What's Wrong with Cars

And so it went, the speaker insisting that the strength of parts must go up and the weight down; that you can fool the automobile owner into carrying around several hundred pounds of extra weight, for which he not only pays and on which the manufacturer makes a profit, and into buying the gasoline that hauls this weight about the countryside; that in the case of an airplane the difference of 100 lb. is the difference between operating an airline at a profit and at a loss; that the public knows what it wants and, notwithstanding predictions of automobile executives to the contrary, will buy automobiles when the kind it wants are built; that weight is not the basis of luxury, even though Pullman-car people like to tell the public that it is, and that most people do not enjoy sitting on top of a light coil spring with a 1000-lb. axle jumping up at them at every irregularity in the road; that low-pressure tires make it necessary to raise the center of gravity of the vehicle rather than to lower it, as has been preached in the industry, and that in applying the airwheel to the automobile two things are wrong: (*a*) the car that must be put on the tire and (*b*) the things that must be done to the tire to put it on the car.

Mr. Stout's talk was discussed by Austin M. Wolf, Edward P. Warner, E. B. Neil, of the Philadelphia Section; W. P. Kennedy, Herbert Chase, J. A. Anglada and others. Clarence Chamberlin was present and was introduced to the Section.

Vincent G. Apple

HOSTS of members of the Society and others in the automotive industries are greatly deploring the death on Sept. 25 of Vincent G. Apple, a pioneer in the inventing, designing and manufacture of electrical devices for motor-vehicles and a member of the Society since 1907. Mr. Apple was the 106th man to join the Society and had for many years taken an active part in its activities. He had been ill at his home in Dayton, Ohio, for the last year.

Mr. Apple had devoted his business career to the automotive electrical industry and was the owner of more than 200 live patents and half as many expired patents on dynamos and other ignition apparatus, lighting and starting devices and kindred motor-vehicle equipment. He is credited with having brought tungsten electric-light bulbs to this Country from Austria prior to 1907, to have installed the first electric lights on automobiles and invented one of the first electric starters and to have made the first in-block engine.

Born at Miamisburg, Ohio, in January, 1875, he secured his education in the grammar and high schools and correspondence and commercial schools. At the time of joining the Society he had been engaged for about 12 years in inventing and manufacturing and was vice-president and general manager of the Dayton Electric & Mfg. Co., of Dayton. A few years later he organized the Apple Electric Co., of Dayton, to manufacture his starters, and was proprietor, general manager and president until he sold the company to the Splitdorf Electrical Co. in 1914. Two years later he established the Vincent G. Apple Laboratories in Dayton and was proprietor up to the time of his death.

Mr. Apple served the Society as a member of the Special Committee on Electric-Lighting Outfits in 1913, a member of the Electric-Equipment Division of the Standards Committee in 1914, a member of the Sections Committee representing the Dayton Section from 1926 to 1932, Chairman of that Committee in 1928 and a member of the Membership Committee in 1931. He held the admiration and affection of innumerable friends for his engineering and business ability and his genial personality.

Personal Notes of the Members

Keys Chosen S.A.E. Councilor

Water C. Keys, of Detroit, was selected at the meeting of the Council of the Society in Cleveland on Aug. 31 to fill the vacancy on the Council of the Society caused by the recent death of Fred S. Duesenberg. He will hold office until the election of officers and Councilors next January, as Mr. Duesenberg's term expires at the end of this year.

Mr. Keys well deserved this selection by reason of his active work for the Society, of which he became a member in 1915. Since that time he has continuously served on one or more of the following committees: Standards, Sections, Motor-Vehicle, Research, Meetings and Passenger-Car.

In the industry, since joining the Society, Mr. Keys was successively assistant chassis engineer of the Cadillac Motor Car Co., of Detroit; development engineer and assistant director of engineering of the Standard Parts Co., of Cleveland; plant engineer of the Eaton Axle Co., of Cleveland; general manager of the Cincinnati axle plant of the Standard Parts Co.; manager and factory representative of the Gabriel Snubber Sales & Service Co. of Detroit; chief engineer of the automotive development department of the United States Rubber Co., of Detroit; and, since 1930, consulting, development and sales engineer on his own in Detroit. He has long been active in the Cleveland and Detroit Sections and has been instrumental in securing scores of new members for the Society in the last 17 years.

Ingersoll Now a Patent Attorney

George Burt Ingersoll, who has been chief engineer of the Federal Motor Truck Co., of Detroit, for the last eight years, recently resigned that position and will devote his time to the practice of patent and trademark law. Mr. Ingersoll is an attorney at law and a registered patent attorney and is well known as the inventor of several automotive devices that have been produced and marketed. Within the last five years he developed the Federal six-wheel truck and the Federal Reservoil system of chassis lubrication. His offices are located in Detroit.

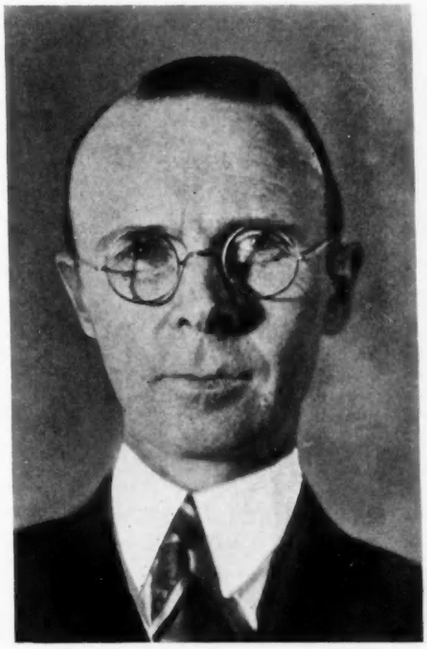
Land Now a Rear Admiral

Capt. E. S. Land has been elevated to the rank of rear admiral and has been transferred from the Office of Naval Operations in the City of Washington to the post of chief constructor and chief of the Bureau of Construction and Repair at the Navy Department in the capital. A review of Admiral Land's long service career in the Navy was published in this department of the S.A.E. JOURNAL for April, 1930, p. 525.

Roy F. Anderson recently assumed the duties of assistant body engineer with the Auburn Automobile Co., of Auburn, Ind. Prior to this appointment he was sales engineer for the Murray Corp. of America, of Detroit.

Walter Bishop, Jr., formerly service engineer for the Warner Aircraft Corp., of Detroit, now occupies a position in the motor division of the engineering department of the Willys-Overland Co., of Toledo, Ohio.

David A. Cain assumed, on Sept. 1, the duties of lubricating engineer with the Master Lubricants Co., of Los Angeles. From 1925 to 1930 he was lubricating engineer of the Union Oil Co. of California and in 1931 was manager for the Central American countries for F. R. Burnham, distributor of that company's products.



WALTER C. KEYS

Alben F. Carlson, who was chief body draftsman for the Pierce-Arrow Motor Car Co., of Buffalo, is now retail-sales manager for the North Bailey Motors, of Buffalo, dealer in Willys-Overland and Willys-Knight cars.

W. L. Carver, formerly on the president's staff of the General Motors Export Co., of New York City, recently assumed new duties as assistant to the president of the National Industrial Conference Board, also of New York City.

J. M. Connelly is now filling the post of research engineer with the Kelvinator Corp., of Detroit, his former position having been that of chemist for the company.

Joseph T. Gleick is now factory manager of the Diorama Corp. of America, in Chicago, having given up his former position as an industrial engineer at the Hawthorne Works of the Western Electric Co.

Alexis S. Gorshkoff recently relinquished his post of aeronautic engineer with the New Standard Aircraft Corp., of Paterson, N. J., and is located in New York City.

William E. Herby has given up his position as acting chief engineer with the Kinner Airplane & Motor Corp., of Glendale, Calif., and is temporarily in Springfield, Ohio.

Hall L. Hibbard, formerly supervising engineer of Stearman-Varney, Inc., of Alameda, Calif., has joined the Lockheed Aircraft Corp., of Burbank, Calif.

Major James R. Hill, U. S. A., formerly assigned to the Army War College, City of Washington, has been transferred to the Holabird Quartermaster Depot, at Baltimore, where he is assistant commandant of the Quartermaster Corps Motor Transport School.

Charles B. Jahnke has been advanced from the position of engineer on internal-combustion engines with the International Harvester Co., of Chicago, to that of research engineer of the same company.

Clifford J. Leisy is now assistant chief engineer of the Great Lakes Aircraft Corp., of Cleveland, having been promoted from the position of project engineer, which he had held with the company since it took over the Glenn L. Martin Co. plant at Cleveland in January, 1929. He had been associated with the Martin company since 1919, when, at 16 years of age, he started as blueprint boy. He has held almost every position the engineering department offered, including that of staff engineer in charge of stress analysis, weight control and static testing.

Edward A. Malin has severed his connection with the Pittsburgh Parts Corp., of Pittsburgh, of which he was vice-president in charge of engineering for the last six years. Before that, he was employed by the Gulf Refining Co. in supervising the design of motor-truck maintenance shops and shop forms and records.

Claude N. Maurer, who formerly was director of highway sales for the Heil Co., of Milwaukee, is now connected with Indiana Trucks, Inc., of Marion, Ind., in the capacity of sales engineer.

Alfred S. Otton, formerly divisional sales manager of the Moto Meter Co., of Long Island City, N. Y., and recently sales executive of the New York Lubricating Oil Co., is now in charge of sales and distribution for the Lubriplate Corp., of New York City, for the Central Atlantic territory. His headquarters are in Philadelphia.

Applicants Qualified

The following applicants have qualified for admission to the Society between July 11 and Sept. 10, 1932. The various grades of membership are indicated by (M) Member; (A) Associate Member; (J) Junior; (Aff.) Affiliate; (S M) Service Member; (F M) Foreign Member.

ANDERSON, J. A. (M) superintendent of equipment, Missouri State Highway Department, *Jefferson City, Mo.*

ATWELL, HAROLD V. (M) chemical engineer, Gasoline Products Co., Inc., 2900 Chrysler Building, 405 Lexington Avenue, *New York City.*

BAGLEY, THOMAS J. (A) chief chemist, R. M. Hollingshead Co., Camden, N. J.; (mail) 208 Mount Vernon Avenue, *Haddonfield, N. J.*

BALL, GEORGE W. (J) junior mechanical engineer, aeronautical engine laboratory, Naval Aircraft Factory, *Philadelphia;* (mail) 1322 Morris Street.

BARR, ROBERT (A) manager, president, Winchester Garage Co., Ltd., 2 and 4 Lancaster Avenue, *Toronto, Ont., Canada.*

BISHOP, A. H. (M) vice-president, Autocar Sales & Service Co., 27th and Sisson Streets, *Baltimore.*

BLACK, JOHN PAUL (A) director, general manager, Standard Motor Co., Ltd., *Canley, Coventry, England.*

BOERLAGE, G. D. (F M) director, Proeptation Delft, Bataafsche Petroleum Maatschappy, Haag, Holland; (mail) Proeptation Delft, *Delft, Holland.*

BONAME, ROBERT VICTOR LOUIS (J) research chemist, McCormick's & Co., *Baltimore;* (mail) 2404 Callow Avenue.

BROUILLETTE, THEODORE R. (J) planning engineer, Aluminum Industries, Inc., *St. Cloud, Minn.*

BUNCE, JOHN LEE (J) service manager, Pratt & Whitney Aircraft Co., *East Hartford, Conn.*

CHALK, HAROLD (J) research engineer, automotive powerplant experimental department, Ethyl Gasoline Corp., Detroit; (mail) 611 Lake View Ave., *Birmingham, Mich.*

CLAIR, GEORGE P., JR. (A) sales manager, United Wheel & Rim Service, Inc., 1420 Fairmount Avenue, *Philadelphia.*

COHEN, SHELDON J. (A) manager, Toronto branch, Monarch Battery Mfg. Co., Ltd., *Kingston, Ont., Canada.*

COLEMAN, LEROY A. (M) assistant works manager, Edward G. Budd Mfg. Co., 12141 Charlevoix Avenue, *Detroit.*

CONTINENTAL OIL CO. (Aff.) Continental Oil Building, *Ponca City, Okla.;* Representative: Kennedy, Harry J., general sales manager.

DIEDERICH, GEORGE N. (A) publisher, *Chevrolet Dealers News, Inc.,* 4450 Ravenswood Avenue, *Chicago.*

DORMAN, BERNHARDT L. (J) experimental engineer, Paragon Vaporizer Corp., Chicago; (mail) 2124 English Avenue, *Indianapolis.*

DUNNING, HARRY, JR. (A) foreman, road-test garage, The Texas Co., Drawer F, *Beacon, N. Y.*

DYKES, JOHN ALBERT (A) service manager, J. H. Early Motor Co., Ltd., Third Avenue and 23rd Street, *Saskatoon, Sask., Canada.*

FADELY, JAMES M. (J) service engineer, Warner Gear Co., Muncie, Ind.; (mail) Route 2, *Middletown, Ind.*

GILE, TRUMAN (A) instructor, aeronautic division, Automotive Trades High School, 2315 Iowa Street, *Cincinnati.*

GONNASON, RAY (A) president, Gonnason Bros., Inc., Central Avenue and Titus Street, *Kent, Wash.*

GRAY, GEORGE E. (M) manager, automotive division, Shell Eastern Petroleum Products, Inc., 122 East 42nd Street, *New York City.*

GRIZZLE, HOMER (A) zone parts and service manager, Chevrolet Motor Co. of Texas, *El Paso, Tex.*

GROSNY, FRIDRICH G. (F M) experimental engineer, Petrowka 15 kw 45, *Moscow, U.S.S.R.*

HAISS, R. C. (M) vice-president, George Haiss Mfg. Co., Inc., 391 Canal Place, *New York City.*

HANSEN, LIEUT. HAROLD D., U.S.M.C. (S M) motor-transport officer, Marine Barracks, *Parris Island, S. C.*

HEYDUCK, FIRST-LIEUT. LAWRENCE E., U.S.A. (S M) First Field Artillery, *Fort Sill, Okla.*

HIBRI, KHALIL (A) partner, Hibri Automotive Co., P. O. Box 123, *Beyrouth, Syria.*

HOLLISTER, K. L. (M) engineer, The Texas Co., New York City; (mail) Box 418, *Ridgewood, N. J.*

HOWARD, WILLIAM HAND BROWNE (A) production manager, General Refining Co., 2100 West Baltimore Avenue, *Baltimore.*

KEPLINGER, JOHN C. (M) vice-president, in charge of sales, Hercules Motors Corp., *Canton, Ohio.*

KEVERS, NORMAN R. (A) president, Electronic Laboratories, Inc., 122 West New York Street, *Indianapolis.*

KING, HENRY FRANCIS (M) research associate, Massachusetts Institute of Technology, Room 1-131, *Cambridge, Mass.*

KLINE, WILLIAM L. (J) Kline Mfg. Co., 303 South Dawson Avenue, *Columbus, Ohio.*

KRAUTHOFF, FIRST-LIEUT. SAMUEL VANCE, U.S.A. (S M) 11th Field Artillery Brigade Motor School, *Schofield Barracks, T. H.*

LAKEVOLD, HENRY JULIUS (A) automobile mechanic, Los Angeles County, Los Angeles; (mail) *Swartout, Calif.*

LARSEN, AGNEW E. (M) chief engineer, Autogiro Co. of America, Philadelphia; (mail) *Willow Grove, Pa.*

LATHAN, A. E. (J) field engineer, Lathan Co., Inc., 1466 Pine Street, *San Francisco.*

LEUKHARDT, A. R. (A) Eastern engineering representative, Bendix-Westinghouse Automotive Air Brake Co., 150 Broadway, *New York City.*

LEWIS, HARRY R. (A) president, Conewango Refining Co., *Warren, Pa.*

LONG, RICHARD C. (A) sales manager, Wheels, Inc., 630 West 52nd Street, *New York City.*

MARCHAND, WILLIAM CHARLES (F M) layout and design, Continental Motors Corp., Detroit; (mail) 44 de Smet de Naeyerlaan, *Ostende, Belgium.*

MARTIN, EDWARD ALFRED (J) draftsman, Ford Motor Co., Lincoln body-engineering division, *Dearborn, Mich.;* (mail) Apartment 303, 624 Brady Street.

MAURER, PAUL H. (J) engineering department, Eclipse Machine Co., Elmira Heights, N. Y.; (mail) 110 Evergreen Avenue, *West Elmira, N. Y.*

MCGRATH, JOSEPH (A) garage superintendent, Freihofer Baking Co., *Philadelphia;* (mail) 3323 Cottman Street.

MESARA, DOUGLAS K. (J) mechanic, Packard Motor Car Co., *Detroit;* (mail) 6000 Somerset Avenue.

MILLER, OSCAR R. (A) assistant secretary, general sales manager, United States Graphite Co., 1430 Holland Street, *Saginaw, Mich.*

NELSON, HENRY B. (A) chief inspector, Kenworth Motor Truck Corp., *Seattle;* (mail) 4235 Sixth Street, N. E.

NEWLIN, WILLIAM SIMS (A) salesman, Sun Oil Co., Philadelphia; (mail) Sycamore Farm, *Media, Pa.*

NISLEY, CAPT. HAROLD A., U.S.A. (S M) chief, automotive section, manufacturing service, Ordnance Department, *City of Washington.*

OCHS, C. I. (M) president, Eaton Mfg. Co., 739 East 140th Street, *Cleveland.*

PALM, JOHN V. O. (M) chief engineer, Cleveland Graphite Bronze Co., Cleveland; (mail) 3262 Scarboro Road, *Cleveland Heights, Ohio.*

PEAT, LESLIE (A) managing editor, *Automotive Industries,* Chilton Class Journal Co., 56th and Chestnut Streets, *Philadelphia.*

PONTREMOLI, JEAN (F M) assistant chief engineer, Société des Moteurs Gnome et Rhone, *Paris, France;* (mail) 1 Rond Point Bugeaud.

POWELSON, WILLIAM H. (J) service engineer, J. G. Brill Co., Philadelphia; (mail) 226 North Sixth Street, *Darby, Pa.*

PRICKETT, RUSSELL (M) instrument maker, Princeton University, *Princeton, N. J.;* (mail) 152 Nassau Street.

PUZIK, OTTO V. (M) checker, Auburn Automobile Co., *Auburn, Ind.;* (mail) 824 East Seventh Street.

RABEIRIN, JEAN (F M) engineer, Automobiles Renault, *Courbevoie, Seine, France;* (mail) 1 Avenue de la Liberte.

RAKHMANOVICH, A. (J) student, Purdue University, *Lafayette, Ind.*

RAMSEY, CLELL C. (J) maintenance helper, Van de Kamp's Holland Dutch Bakers, Inc., *Seattle;* (mail) 309 Boylston Avenue North.

REDICK, ARTHUR WILLIAM (A) foreman of mechanics, South African Railways, Kazerne, Johannesburg, South Africa; (mail) 56 Yeo Street, *Yeoville, Johannesburg, South Africa.*

RITZ, FREDERICK (M) superintendent, precision pump department, Fairbanks, Morse & Co., *Beloit, Wis.;* (mail) 1263 Eaton Avenue.

ROESING, W. H. (A) field representative, Champion Spark Plug Co., Toledo; (mail) Del Rae Apartments, *Wichita, Kan.*

ROSENQUEST, JOHN BUTLER (A) sales manager, General Motors Truck Co., 211 West 61st Street, *New York City.*

ROSS, SIMON M. (J) junior mechanical engineer, aeronautical engine laboratory, Naval Aircraft Factory, *Philadelphia.*

RUSSELL, JAMES (A) master artificer, Royal Canadian Ordnance Corps, Winnipeg; (mail) 203 Brooklyn Street, *St. James, Man., Canada.*

SCHIMPF, FRED J. (S M) supervising draftsman, Naval Aircraft Factory, *Philadelphia;* (mail) 4221 North Ninth Street.

SCHNEIDER, C. L. (M) district manager, central region, Fruehauf Trailer Co., Detroit; (mail) 3840 South Michigan Avenue, *Chicago.*

SCHWARZ, ALFRED (M) vice-president, Fuel Oil Motors Corp., 120 Broadway, *New York City.*

SHEPARD, CERVANTES A. (A) vice-president, treasurer, Inter-State Oil Co., 87 Shawnee Avenue, *Kansas City, Kan.*

SMITH, D. MYRLE (M) engineer, McQuay-Norris Mfg. Co., St. Louis; (mail) 215 Kerruish Place, *Webster Groves, Mo.*

STANLEY, RICHARD O. (A) district master mechanic, State of Washington Department of Highways, 612½ Main Street, *Vancouver, Wash.*

SWEENEY, LEWIS J. (A) sales engineer, E. P. Rotzell Co., 3400 North 19th Street, *Philadelphia.*

TAYLOR, JOHN B., JR. (J) sales engineer, Ethyl Gasoline Corp., New York City; (mail) 1217 Court Square Building, *Baltimore.*

TAYLOR, SAMUEL BARTRAM R. (J) research assistant, Vacuum Oil Co., Inc., Paulsboro, N. J.; (mail) 2115 Pine Street, *Philadelphia.*

THOMPSON, JOHN PAUL (J) junior aeronautical engineer, Naval Aircraft Fac-

tory, Philadelphia; (mail) Newton Hotel, *Woodbury, N. J.*

VINCENT, EDWARD T. (M) research engineer, in charge of Diesel activities, Continental Motors Corp., *Detroit;* (mail) 1515 McClellan Avenue.

WALLACH, IRVING DAVID (J) Federal Shipbuilding & Drydock Co., Kearny, N. J.; (mail) 710 East Broad Street, *Westfield, N. J.*

WATSON, DONALD REED (S M) draftsman, Naval Aircraft Factory, Philadelphia; (mail) 119 Forrest Street, *Conshohocken, Pa.*

WESTACOTT, EDWIN HUGH (F M) assistant head, transportation department, Caribbean Petroleum Co., *Maracaibo, Venezuela.*

WEYL, GEORGE J. (J) draftsman, Chevrolet Motor Co., *Detroit;* (mail) Fisher Branch, Y. M. C. A.

WILLIAM, CAPT. LAURIN L., U.S.A. (S M) Infantry School, *Fort Benning, Ga.*

WOODIER, HUGH D. (M) machine designer, Austin Mfg. Co., Harvey, Ill.; (mail) 45 West 151st Street, *New York City.*

WOOTEN, WESLEY M. (A) product research and service testing, Standard Oil Co. of California, 225 Bush Street, *San Francisco.*

Applicants for Membership

The applications for membership received between Aug. 15 and Sept. 15, 1932, are listed below. The members of the Society are urged to send any pertinent information with regard to those listed which the Council should have for consideration prior to their election. It is requested that such communications from members be sent promptly.

BRONSTEIN, JACOB ISAAC, engineer, Scientific Diesel Institute, *Leningrad, U.S.S.R.*

COSFORD, E. J., president and manager, Associated Equipment Co. of Canada, Ltd., *Montreal, Que., Canada.*

DALEY, JOSEPH CHARLES, field mechanic and inspector, Sinclair Refining Co., *Philadelphia.*

DOWNING, GEORGE F., service manager, The White Co., *Long Island City, N. Y.*

DUNNING, CHESTER B., mechanic, U. S. S. Langley, *San Francisco.*

EFFMANN, KARL H., designer, Merz Engineering Co., *Indianapolis.*

HAUSER, ERNST A., DR., Metallgesellschaft A.G., *Frankfurt am Main, Germany.*

KOCHENBERG, FRANCIS E., automobile machinist, acting foreman, Fire Department of New York, *New York City.*

LAURINI, ALBERT SILVIO, assistant manager, Auto Garages (Western), Ltd., *Bristol, England.*

LERNER, WILLIAM H., foreman, Buick Motor Co., *Flint, Mich.*

LORD, THOMAS, general manager, Lord Mfg. Co., *Erie, Pa.*

MEAD, LYNN D., engineer, Continental Divco Co., *Detroit.*

MEYER, LUCIEN, French technical interpreter, Wright Aeronautical Corp., *Paterson, N. J.*

MILNE, ALEXANDER, service manager, Regal Motors, Ltd., *Rosetown, Sask., Canada.*

NIXON, STANLEY WORKMAN, instruction engineer, Pressed Steel Co. of Great Britain, Ltd., *Oxford, England.*

O'SHAUGHNESSY, JOSEPH F., vice-president, United States Rubber Co., *New York City.*

SHARP, RICHARD S., branch service manager, Wagner Electric Corp., *St. Louis.*

Dickinson Nominated for S.A.E. Presidency

(*Concluded from p.* 25)

C. F. Lienesch, Union Oil Co. of California (Southern California Section)
Carl T. Doman, H. H. Franklin Mfg. Co. (Syracuse Section)
*C. S. Bruce, Bureau of Standards (Washington Section)
Mac Short, Stearman Aircraft Co. (Wichita Section)

Members at Large, Chosen at Business Session

H. D. Dawson, Delco Remy Corp.
P. J. Kent, Chrysler Corp.
J. F. Winchester, Standard Oil Co. of New Jersey

Activities Nominating Committees

(To Nominate Vice-Presidents)

Aircraft Activity

G. W. Lewis, National Advisory Committee for Aeronautics, Chairman
Richard Gazley, Department of Commerce
A. E. Larsen, Autogiro Co. of America
Glenn L. Martin, Glenn L. Martin Co.

Aircraft-Engine Activity

Robert Insley, Continental Aircraft Engine Co., Chairman
R. M. Hazen, American Airplane & Engine Corp.
M. J. Steele, Packard Motor Car Co.
N. N. Tilley, American Airplane & Engine Corp.

Diesel-Engine Activity

O. D. Treiber, Hercules Motors Corp., Chairman
A. L. Beall, Vacuum Oil Co.
L. F. Burger, International Harvester Co.
A. J. Poole, Bendix Aviation Corp.

Motorcoach and Motor-Truck Activity

T. C. Smith, American Telephone & Telegraph Co., Chairman
A. K. Brumbaugh, White Motor Co.
Adrian Hughes, Jr., United Railways & Electric Co. of Baltimore
H. V. Middleworth, Consolidated Gas Co. of New York

Passenger-Car Activity

Alex Taub, Chevrolet Motor Co., Chairman
H. C. Dickinson, Bureau of Standards
F. S. Duesenberg
W. S. James, Studebaker Corp.

Passenger-Car-Body Activity

A. J. Neerken, Hupp Motor Car Corp., Chairman
R. S. Davis, Ford Motor Co.
G. J. Monfort, Chrysler Motors
E. J. Nusbaum, Briggs Mfg. Co.

Production Activity

A. K. Brumbaugh, White Motor Co., Chairman
D. S. Devor, Timken-Detroit Axle Co.
W. W. Nichols, D. P. Brown & Co.
Stanley Whitworth, Bendix Aviation Corp.

Transportation and Maintenance Activity

T. C. Smith, American Telephone & Telegraph Co., Chairman
W. J. Cumming, Surface Transportation Corp.
M. C. Horine, International Motor Co.
G. O. Pooley, Chesapeake & Potomac Telephone Co. of Baltimore City.

*Present at meeting of Annual Nominating Committee, Jan. 26, 1932.

[2] M.S.A.E.—Engineer, automotive equipment and construction apparatus, American Telephone & Telegraph Co., New York City.

Production Engineering

(*Concluded from p.* 26)

the die builder regarding a design in which it is desired to combine several parts into one unit, thus eliminating a costly assembly.

Ideas that might seem foolish today may become realities tomorrow. Dies will always play an important part in the fabrication of the automobile body. They deserve recognition as a leading and important requisite, together with their trained and particularly adapted personnel. The die industry as a whole must have the moral support of the manufacturers and engineers.

Quiet Bodies Essential

In commenting on body design, following the presentation of the paper, T. C. Smith[2] remarked that not enough consideration is given to design features which will assure continued quietness of operation. This matter is very important, he said. Usually, it is possible for the dealers to deliver cars with bodies which have been tightened up to the extent that they will remain quiet for possibly a few hundred miles. After this, it is a more or less constant maintenance job to eliminate body noises. The more elusive squeaks come in joints which are invisible and located at inaccessible points under the upholstery where they cannot readily be tightened. Much of the noise, however, is attributable to door hangers and locks. Door hardware, especially the mechanisms for raising and lowering windows and the guides for the windows themselves, causes considerable noise. Many cars with mechanically excellent chassis have been condemned by the users because insufficient attention has been given in the body design to preventing body noise, he said in conclusion.

Notes and Reviews

AIRCRAFT

Zur Frage der Abmessungen von Luftreifen für Flugzeuglaufräder. By Franz Michael. Published in *Zeitschrift für Flugtechnik und Motorluftschiffahrt*, July 14, 1932, p. 377. [A-1]

With the introduction in this Country of large-diameter low-pressure airplane tires, the trend toward simplification and standardization of airplane-tire sizes was interrupted. The German institute for aeronautical research, in this article, attempts to set up a fundamental basis for the discussion of high versus low-pressure aircraft tires and to establish a method for judging the merits of various tire sizes.

For judging the damping characteristics, the results of static-impact tests are described, formulas developed, the reactions incurred in rolling over obstacles described and the relation of tire springing to the total spring suspension analyzed. Other factors governing the choice of tire size, such as tractive resistance, wheel load, braking action and aircraft weight, are discussed. Finally, a series of tire sizes is proposed as a basis of discussion for purposes of standardization.

Verfahren zur Erleichterung von Blindlandungen. By M. Heinrich Gloeckner. Published in *Zeitschrift für Flugtechnik und Motorluftschiffahrt*, June 24, 1932, p. 347. [A-1]

A summary of the navigational aids to blind flying developed in various countries is presented herein. Long-distance radio beacons and direction finding are briefly treated, attention being given chiefly to landing, which is the critical factor in safe flying. Under this head are discussed methods of locating the landing-field and determining its boundaries, and expedients for fixing the altitude of the airplane, such as altimeters and acoustical, electrical and radio devices.

The criteria of blind-flying aids are said to be the definiteness of the signals and the ease with which they can be understood, reliability in operation, space required for and weight of instruments to be carried on the airplane and the facility with which the pilot can make use of such instruments.

A bibliography containing 31 items is appended.

Untersuchung der Trudeleigneschaften des Musters Focke-Wulf A-32 Bussard. By Hans-Deitrich Knoetzsch. Published in *Zeitschrift für Flugtechnik und Motorluftschiffahrt*, June 24, 1932, p. 356. [A-1]

A Focke-Wulf monoplane, the wings of which were specially designed to prevent spinning, was subjected to flight tests to see if the desired end had been attained. Through variations in loading, the center of gravity was shifted to five different positions, tests being made at each. The airplane could be thrown into a spin only when the center of gravity was at the position farthest astern, and it could be held in the spinning maneuver for only three revolutions, each lasting 3.4 sec.

These items, which are prepared by the Research Department, give brief descriptions of technical books and articles on automotive subjects. As a rule, no attempt is made to give an exhaustive review, the purpose being to indicate what of special interest to the automotive industry has been published.

The letters and numbers in brackets following the titles classify the articles into the following divisions and subdivisions: *Divisions*—A, Aircraft; B, Body; C, Chassis Parts; D, Education; E, Engines; F, Highways; G, Material; H, Miscellaneous; I, Motorboat; J, Motorcoach; K, Motor-Truck; L, Passenger Car; M, Tractor. *Subdivisions*—1, Design and Research; 2, Maintenance and Service; 3, Miscellaneous; 4, Operation; 5, Production; 6, Sales.

XXI. Ordentliche Mitglieder-Versammlung der Wissenschaftlichen Gesellschaft für Luftfahrt E. V. (WGL). Published in *Zeitschrift für Flugtechnik und Motorluftschiffahrt*, July 28, 1932, p. 401. [A-1]

The Wissenschaftliche Gesellschaft für Luftfahrt (Scientific Aeronautic Association), a group of about 800 members, held its 21st regular meeting last June. Representatives of France and Japan and of virtually all German aeronautic societies and technical universities were present.

The activities of the association are recapitulated, special attention being given to the year's accomplishments of the technical committees. Summaries are given in this issue of the *Zeitschrift für Flugtechnik und Motorluftschiffahrt* of the papers presented on the lift and drag of slotted wings, adjustable-pitch propeller design, aircraft instruments and lighter-than-aircraft construction.

Seventeenth Annual Report. Published by the National Advisory Committee for Aeronautics, City of Washington, 1931; 722 pp. Including Technical Reports Nos. 365 to 400. Price, $3. [A-1]

The N.A.C.A. Variable-Density Wind-Tunnel. By Eastman N. Jacobs and Ira H. Abbott. N.A.C.A. Report No. 416, 1932; 12 pp., illustrated. Price, 5 cents. [A-1]

Aircraft Speed Instruments. By K. Hilding Beij. N.A.C.A. Report No. 420, 1932; 59 pp., illustrated. [A-1]

Wind-Tunnel Research Comparing Lateral-Control Devices, Particularly at High Angles of Attack. IV—Floating-Tip Ailerons on Rectangular Wings. By Fred E. Weick and Thomas A. Harris. N.A.C.A. Report No. 424, 1932; 25 pp., with tables and charts. Price, 10 cents. [A-1]

The Effect of Multiple Fixed Slots and a Trailing-Edge Flap on the Lift and Drag of a Clark-Y Airfoil. By Fred E. Weick and Joseph A. Shortal. N.A.C.A. Report No. 427, 1932; 8 pp., with tables and charts. [A-1]

Wind-Tunnel Tests of a Clark-Y Wing with a Narrow Auxiliary Airfoil in Different Positions. By Fred E. Weick and Millard J. Bamber. N.A.C.A. Report No. 428, 1932; 14 pp., with tables and charts. Price, 10 cents. [A-1]

Methods of Visually Determining the Air Flow around Airplanes. By Melvin N. Gough and Ernest Johnson. N.A.C.A. Technical Note No. 425, July, 1932; 8 pp., 16 figs. [A-1]

Characteristics of an Airfoil as Affected by Fabric Sag. By Kenneth E. Ward. N.A.C.A. Technical Note No. 428, August, 1932; 5 pp., 3 figs. [A-1]

Stresses Developed in Seaplanes while Taking Off and Landing. By Rudolfo Verduzio. Translated from *L'Aerotecnica*, November, 1931. N.A.C.A. Technical Memorandum No. 677, July, 1932; 47 pp., 50 figs. [A-1]

Increase in the Maximum Lift of an Airplane Wing Due to a Sudden Increase in Its Effective Angle of Attack Resulting from a Gust. By Max Kramer. Translated from *Zeitschrift für Flugtechnik und Motorluftschiffahrt*. April 14, 1932. N.A.C.A. Technical Memorandum No. 678, July, 1932; 9 pp., 7 figs. [A-1]

Experimental Determination of the Thickness of the Boundary Layer along a Wing Section. By Otto Cuno. Translated from *Zeitschrift für Flugtechnik und Motorluftschiffahrt*, April 14, 1932. N.A.C.A. Technical Memorandum No. 679, August, 1932; 7 pp., 6 figs. [A-1]

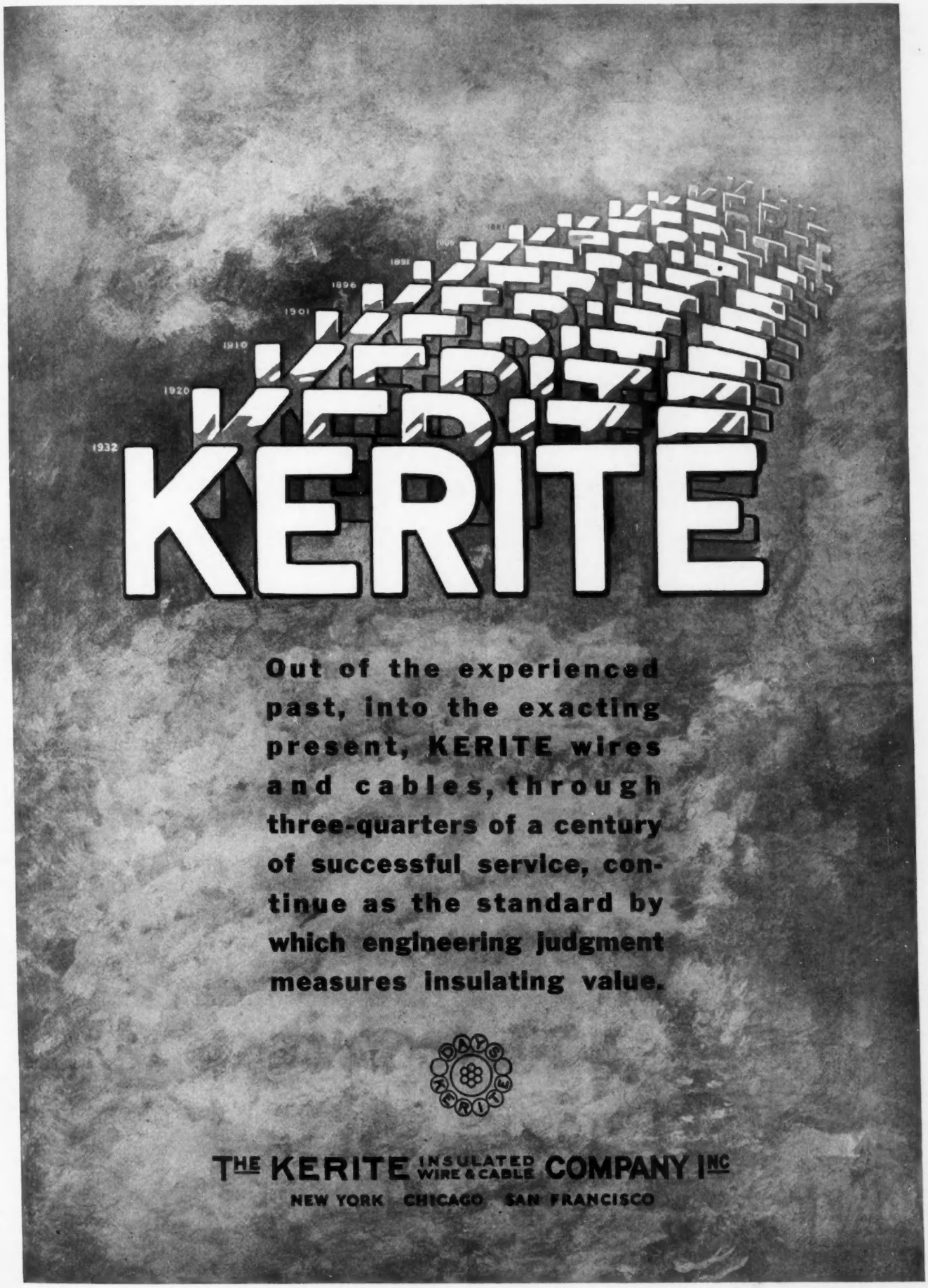
Approximate Calculation of Multi-spar Cantilever and Semicantilever Wings with Parallel Ribs under Direct and Indirect Loading. By Eugene Sänger. Translated from *Zeitschrift für Flugtechnik und Motorluftschiffahrt*, May 14, 1932. N.A.C.A. Technical Memorandum No. 680, August, 1932; 14 pp., 8 figs. [A-1]

Reduction of Wing Lift by the Drag. By A. Betz and J. Lotz. Translated from *Zeitschrift für Flugtechnik und Motorluftschiffahrt*, May 28, 1932. N.A.C.A. Technical Memorandum No. 681, August 1932; 5 pp., 11 figs. [A-1]

Airplane Stability in Taxying. By E. Anderlik. Translated from *Zeitschrift für Flugtechnik und Motorluftschiffahrt*, May 28, 1932. N.A.C.A. Technical Memorandum No. 682, September, 1932; 12 pp., 7 figs. [A-1]

Additional Formulas for Beams Subjected to Axial and Lateral Loads. Air Corps Technical Report No. 3598. Pub-

(*Continued on next left-hand page*)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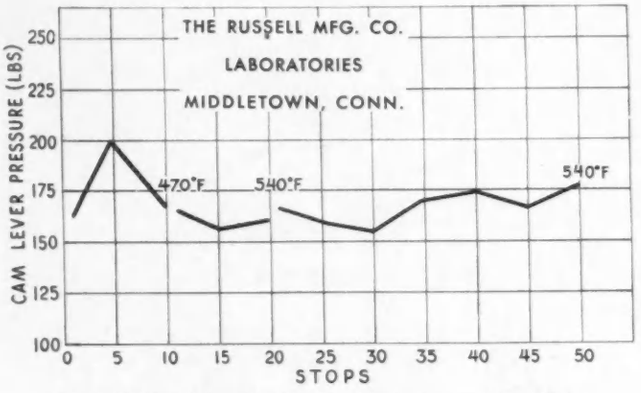

Data: Brake, 15" mechanical-internal; drum, cast iron friction surface, steel backing; equivalent car weight 4600 lbs.; speed 60 m.p.h.; interval, 40 secs.; constant deceleration 16 ft./sec.²

A major difficulty confronting car and brake manufacturers is the securing of friction materials that do not fade out under continued severe brake applications made from high speeds.

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From Nos. 21 to 50 inclusive, the stops were consecutive. During this portion of the test the lining was operating at an estimated temperature of over 600° (Actual temperature readings plus allowance for cooling while thermo-couples were being inserted between lining and drum). Yet during these 30 consecutive stops the cam lever pressure varied only 20 pounds, indicating practically no fade-out of lining.

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BRAKE LININGS

Notes and Reviews

Continued

lished by the Chief of the Air Corps, City of Washington; June 15, 1932, 9 pp. **[A-1]**

The Use of Gaseous and Liquid Oxygen in the Service. Air Corps Technical Report No. 3443. Published by the Chief of the Air Corps, City of Washington; June 30, 1932; 8 pp., illustrated. **[A-1]**

Dynamic Accelerometer Calibrator. Air Corps Technical Report No. 3457. Published by the Chief of the Air Corps, City of Washington; June 30, 1932; 5 pp., illustrated. **[A-1]**

Allowable Shear from Combined Bending and Torsion in Round, Elliptical and Streamlined Tubes and Allowable Normal Stress from Bending in Thin-Walled Tubes. Air Corps Technical Report No. 3471. Published by the Chief of the Air Corps, City of Washington; June 30, 1932; 24 pp., illustrated. **[A-1]**

Dynamic Test of Gruss Shock-Absorber Model X-58. Air Corps Technical Report No. 3499. Published by the Chief of the Air Corps, City of Washington; June 30, 1932; 4 pp., illustrated. **[A-1]**

Circular Ring with Concentrated Loads. Air Corps Technical Report No. 3522. Published by the Chief of the Air Corps, City of Washington; June 30, 1932; 3 pp. **[A-1]**

Longitudinal Shearing Stress in a Beam of Constant or Variable Cross-Section. Air Corps Technical Report No. 3523. Published by the Chief of the Air Corps, City of Washington; June 30, 1932; 2 pp. **[A-1]**

Longitudinal and Transverse Shearing Stress in a Monocoque Fuselage of Constant or Variable Cross-Section. Air Corps Technical Report No. 3525. Published by the Chief of the Air Corps, City of Washington; June 30, 1932; 2 pp. **[A-1]**

Comparative Speed Tests of Wheels. Air Corps Technical Report No. 3564. Published by the Chief of the Air Corps, City of Washington; June 30, 1932; 6 pp., illustrated. **[A-1]**

An Improved Form of Jack for Use in the Load Test of Aeroplanes. By Mineo Yamamoto. Report No. 78 of the Aeronautical Research Institute, Tokio Imperial University, July, 1932, 17 pp., illustrated. **[A-1]**

The author calls attention to certain drawbacks in the ordinary jack as used in the load test of airplanes and describes the way in which the objections have been removed with satisfactory results.

CHASSIS PARTS

New Light on the Strength of Gear Teeth. By A. B. Cox. Presented at the 16th annual meeting of the American Gear Manufacturers' Association, Cleveland, May, 1932. **[C-1]**

The author points out that all gears are much more accurately made now than they were 40 years ago when the Lewis formula was originated. Most high-grade gears now approach mathematical perfection closely enough to make theoretical mathematics usefully applicable to them. The fact that the original Lewis formula is not satisfactory for modern high-grade gears is becoming increasingly recognized.

A method for calculating the strength of gears is set forth and the author contends that this method shows that the gears of the conventional standards are uneconomically designed as regards strength, durability, quietness and efficiency.

Mechanik der Automobillenkung. By Hans Lenk. Published in *Automobiltechnische Zeitschrift*, June 25, p. 294; July 10, p. 321, and July 25, 1932, p. 350. **[C-1]**

A mathematical analysis of the fundamentals governing the steering of automotive vehicles is made in this article in the hope that it may incite research into certain individual problems.

Based on the premise that steering is limited on one hand by the physical prowess of the operator and on the other hand by the laws of friction governing the reactions between road and wheel, the analysis aims to fix what must be the steering process in order that the vehicle shall follow the path desired by the driver and what steering effort is required of the driver.

The rôle of the wheel as a structural and operating unit is shown, the kinematics involved in driving a vehicle on a curved course are analyzed, and constants of vehicle and steering factors that must obtain if both skidding and tipping are to be avoided and developed. Formulas for the determination of steering effect are given, the influence of the drive system—front,

(*Continued on next left-hand page*)

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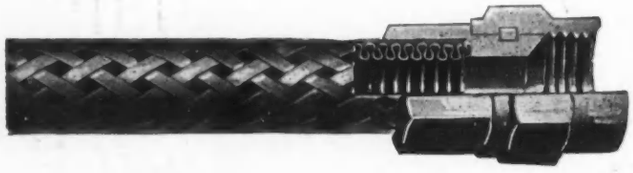

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Notes and Reviews

Continued

rear or four-wheel—is discussed, and merit figures are suggested by which different types of construction can be rated as to security and ease of operation.

Le Joint de Cardan Villard à Compensateur. By C. Faroux. Published in *La Technique Automobile et Aérienne*, second quarter, 1932, p. 33. **[C-1]**

Absolute uniformity in the transmission of motion through a variety of angles is one of the distinguishing characteristics of the Villard universal-joint, according to the author. Other advantages claimed for it are light weight, great compactness and the permitting of higher angular relations than the conventional universal-joint. The disadvantage of extreme delicacy of construction is admitted.

ENGINES

The Effect of Nozzle Design and Operating Conditions on the Atomization and Distribution of Fuel Sprays. By Dana W. Lee. N.A.C.A. Report No. 425, 1932; 19 pp., illustrated. **[E-1]**

Comparative Performance of a Powerplus Vane-Type Supercharger and an N.A.C.A. Roots-Type Supercharger. By Oscar W. Schey and Herman H. Ellerbrock, Jr. N.A.C.A. Technical Note No. 426, July, 1932; 14 pp., 11 figs. **[E-1]**

Heat Dissipation from a Finned Cylinder at Different Fin-Plane/Air-Stream Angles. By Oscar W. Schey and Arnold E. Biermann. N.A.C.A. Technical Note No. 429, August, 1932; 11 pp., 10 figs. **[E-1]**

Effect of Engine-Operating Conditions on the Vaporization of Safety Fuels. By A. M. Rothrock and C. D. Waldron. N.A.C.A. Technical Note No. 430, August, 1932; 8 pp., 11 figs. **[E-1]**

The Mechanical Difficulties of Prestone Cooling at 300 Deg. Fahr. Outlet Temperature. Air Corps Technical Report No. 3474. Published by the Chief of the Air Corps, City of Washington; June 30, 1932; 12 pp., illustrated. **[E-1]**

Studies on the Sounds Emitted by Revolving Airscrews. Parts I and II. By Jûichi Obata. Reports No. 79 and 80 of the Aeronautical Research Institute, Tokio Imperial University; July, 1932, 26 and 51 pp. respectively, illustrated. **[E-1]**

The first report presents the results of investigations made on the sounds emitted by two actual airscrews, one of wood and the other of metal. The sounds were recorded as faithfully as possible by an electrical arrangement consisting of a condenser microphone, a powerful amplifier and an oscillograph. Analyses were made on the records. The components that make up the sounds of a rotating airscrew are described. A 2-A audiometer was also employed for studying the relations between the loudness and the number of rotations and the distance.

Models of one-third and one-quarter the original size of the airscrew were used in the investigations described in the second report. Models of six different airscrews, rotated by a noiseless electric motor, were tested. The tone colors of the sounds of different airscrews were studied, together with scale effect, the effect of variation of the geometrical pitch and the directional property of the sounds. Finally, the general effect of the airscrew sound on human sensation was studied.

On the Formation and Dispersion of Oil Sprays. By Kalman J. De-Juhasz, O. F. Zahn, Jr. and P. H. Schweitzer. Bulletin No. 40. Published by the Pennsylvania State College Engineering Experiment Station, 1932; 94 pp., illustrated. **[E-1]**

This bulletin is a report on experiments made for the study of liquid sprays. The main object of the investigation was to establish the dispersion characteristics of fuel-oil sprays employed in fuel-injection engines.

A number of experiments were made with various liquids, injecting them into atmospheric air. By observing the "break-up distance", the effect of several factors on spray formation was determined.

For experimental determination of the droplet sizes, the spray was caught in a non-miscible liquid medium. Microphotographs of specimens with 200 magnification made possible the measuring of the globule diameters, and from a count of the number of various-size droplets their relative frequency was determined.

The volumetric distribution of oil sprays under predetermined operating conditions was ascertained by the "dispersion rack".

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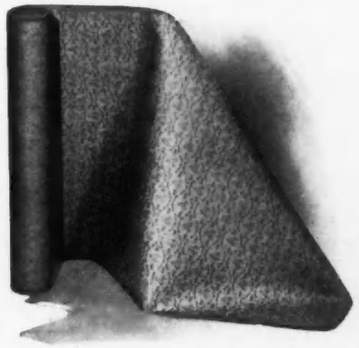

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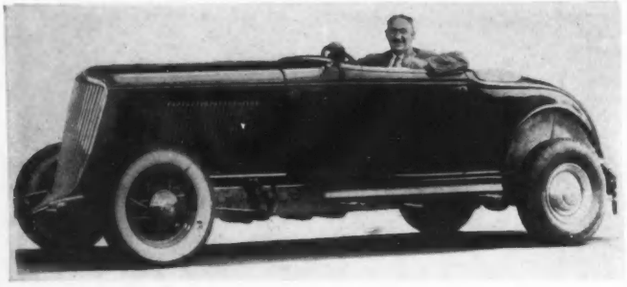
Spicer Joints

Again Help in Establishing

New Records in Motordom



A new record for the eight-mile climb to the summit of Mount Washington, GORHAM, N. H., known as the most difficult ascent east of the Rockies, has been set by Cannon Ball Baker, driving a Graham eight.

The Mount Washington climb has been a test of motor car power and roadability since the early days of motoring.

Salisbury axles and Spicer propeller shafts, manufactured by the Spicer Manufacturing Corporation, contributed to the success of this difficult test and are standard equipment on Graham cars.

Spicer

MANUFACTURING CORPORATION

TOLEDO, OHIO

BROWN-LIPE CLUTCHES and TRANSMISSIONS | SPICER UNIVERSAL JOINTS | SALISBURY FRONT and REAR AXLES | PARISH FRAMES READING, PA.

Notes and Reviews

(Concluded)

which is a skeleton placed in a pressure chamber and holding a number of blotting-paper pads for the interception of parts of the oil spray. The spray patterns so obtained with varying oils, injection pressures, air pressures and orifice dimensions are presented by the use of the "flux" lines, which offer a graphic and convenient means for comparing spray patterns and judging their dispersion.

A method of interpolation based on the probability theory of sprays was found useful in the interpretation of the test data.

Criteria for the Design of Bearings. By Louis J. Bradford. Published in *Product Engineering*, June, 1932, p. 253. **[E-1]**

The factors of bearing pressure, speed of the shaft, and viscosity of the lubricant are discussed in respect of their effect upon bearing design, and the basis of two expressions, $PV = C$ and ZN/P, are explained.

The author cites experimental evidence from which he concludes that $PV = C$ is an empirical equation and suffers from the fault of all empirical equations in that it applies and is safe to use only in the field in which it was developed. The value of C is said to vary tremendously, extremes of 4500 and 418,000 having been obtained for bearings of different types operating under different conditions.

The quantity ZN/P, on the other hand, is said to form an excellent basis for the comparison of bearings that are geometrically similar and perfectly lubricated, provided the value of Z chosen agrees with that actually existing in the film of lubricant in the bearing.

***PV* Factor Is Not Proper Measure of Bearing Capacity.** By P. M. Heldt. Published in *Automotive Industries*, June 11, 1932, p. 842. **[E-1]**

Mr. Heldt analyzes the problem of bearing capacity and points out that heat losses vary with velocity but not with pressure; as velocity is increased, the maximum permissible unit-load decreases, because the greater loss results in a higher oil temperature and lower oil viscosity, and thinner oil will not sustain so high a unit load.

Combustion Knock in Diesel Engines. By P. H. Schweitzer. Presented at the fifth national meeting of the Oil and Gas Power Division of the American Society of Mechanical Engineers at State College, Pa., June 8 to 11, 1932. **[E-1]**

Every factor that causes a gasoline engine to knock is likely to make a Diesel engine run smoother, and what is antiknock in a gasoline engine is pro-knock in a Diesel. These conclusions are drawn by the author from experience with engines of both types, and supporting evidence is given in his paper.

Dr. Schweitzer contends that, in designing a Diesel engine for smooth running, one governing principle should be the shortening of the ignition lag. The problem is essentially one of heat transfer between the hot air and the cold oil drops. Another method of avoiding knock in a Diesel engine is by reducing the quantity of fuel during the ignition-lag period. Means for obtaining a low rate of injection during the initial (delay) period are likely to reduce the knocking tendency of the engine.

The paper is published in abridged form in *Automotive Industries* of June 11, 1932.

MATERIAL

Formation of Gum in Gasoline and Effect on Engine Operation. By O. C. Bridgeman. Published in *The Oil and Gas Journal*, June 9, 1932, p. 55. **[G-1]**

This paper, presented before the midyear meeting of the American Petroleum Institute at Tulsa, Okla., is based upon the work that the Bureau of Standards has been doing on the gum problem in cooperation with the Air Corps and more recently under the auspices of the Cooperative Fuel-Research Steering Committee.

Two phases of the gum problem have been investigated: (*a*) the establishment of a method of test for gum content and (*b*) the development of a method of test for gum stability in storage. Only preliminary work has been done on the third and highly important phase of permissible gum contents of gasolines.